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FORESTRY ABSTRACTS

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SOME IMPROVED TECHNIQUES IN NURSERIES AND ON PLANTING SITES

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Introduction.

There are many influences compelling foresters the world over to revise time-worn practices. These influences are part of the general economic environment in which rising wages and relative shortages of labour are perhaps most significant. They have directly stimulated the search for more economic methods, machines and techniques. This article attempts to review briefly some of the results of these searches, which have shown promise.

In a general way, current and recent developments have proceeded along the two main lines of 'rationalization' and of the application of new techniques to specific operations. The latter, which includes the adoption of mechanization, improved processes with new tools, and new treatments, will form the main subject of this article. The large subject of pre-treatment of seed is excluded.

Rationalization finds scope in such matters as training of supervisors and workers, the administrative organization of work, centralization, accident prevention, housing and amenities, suitability of tools and work simplification generally. At present Sweden leads in the study of these questions. Although the greatest achievement probably lies to the credit of the Swedish Forest Employers' Association and the Swedish Forest Service, private enterprises such as Mo och Domsjö Aktiebolag and the Värmland Skogsarbetsstudier have also played a prominent part. The joint Work Studies Department of the first two organizations (S.D.A.) has been studying aspects of labour efficiency and training in Sweden for the past ten years and has an annual budget of Kr. 300,000 (£20,700). Many publications on various aspects of its research work have emanated from S.D.A. [1, 2, 3]. and English summaries of the recent works have been promised. Apart from many thorough investigations on the relative merits of individual tools, equipment and techniques—mainly used in harvesting operations—much study has been devoted to wages agreements, and satisfactory procedures have been worked out between the employers' organization and representatives of the workers. Special attention is directed to creating a workable, easily understood and flexible basis for piece rates. Similar studies have been proceeding in North America and in Germany, and other countries have introduced or contemplate many forms of rationalization. As an example, centralization of forest nurseries has often been suggested on the grounds that efficient raising of stock requires highly skilled and experienced supervision.

All the problems under the head of rationalization point to the need for a comprehensive and integrated plan to assess and co-ordinate all the factors affecting the efficiency of labour and equipment. It is generally realized that study alone is not enough and that real advances can be made only by training workers on the job. As much of the work and ideas on the general question of efficiency involve welfare, social services and amenities have taken a prominent place among the relevant studies.

On the side of new technical developments North America has been regarded, for many years, as one of the greatest pioneers, notably in mechanization. In agriculture the application of labour-

saving devices has gone a long way. It is not surprising, therefore, that forestry operations have been carried out by agricultural methods and machines or adaptations of them, and that other countries have looked towards America for improvements in technique. Although the problem of saving labour is more pressing and has therefore acted as a stimulus to mechanical invention in America, it must not be overlooked that European countries have made permanent and significant contributions to new techniques and have led in the application of scientific discovery. Individual countries have felt the need for research on mechanical equipment suited to their own circumstances and for the progressive introduction of technical improvements. To some, as for example, Denmark, the great problem is the provision of the initial capital [4]. A possible solution would be the co-operative ownership of equipment or the use of multi-purpose equipment. The kind of contracting service provided by the County Agricultural Executive Committees in Britain is another way of meeting modern requirements.

The applications of scientific discovery to specific problems of forest and plant development are too numerous and specialized to cover in this article; but passing mention may be made of the significance of the work on soil improvement (particularly in nurseries), seed husbandry, provision of ground cover, fertilizers, composts, and selective weed control.

Nurseries.

Until recently it could be said that nursery operations were the least mechanized in forestry. In Britain, in the short history of the Forestry Commission, it is apparent that about a quarter of the total operational expenditure has been on nurseries. In contrast to other forest operations nursery practice is extremely intensive and the productivity bears comparison with that of market-gardening. At the same time the average private owner of woodlands has insufficient areas under woodlands to justify a large nursery even where a significant proportion of the surplus nursery produce can be sold. So long as private nurseries remain small, the scope for applying new techniques is limited. It is being realized more and more, however, that much nursery work is highly skilled. With shortages of many varieties of seeds and with a big demand for nursery stock for large afforestation programmes, an obvious economy arises from centralized nursery production. The general economy of large-scale operations and the degree of specialization required for efficient production, combined with the adoption of expensive machines like mechanical cultivators, are all powerful factors moulding the organization and equipment of modern nurseries.

Toumey [5] has emphasized that in America, along with the efforts to reduce both nursery and planting costs, an equally strong effort was made to obtain high survival rates. In North America the great development by federal and local governments of forest and shelterbelt planting has brought many new or modified practices to nursery operations. Among the more significant of these have been the construction at large nurseries of efficient seed-extraction and seed-storage plants and the mechanization of nearly all the main operations in seed extraction and production of nursery stock. Emphasis is laid on trying out new methods under local conditions before they are adopted as part of standard practice.

Efficiency in production of nursery stock is gauged by the same criteria of cost and survival in British Columbia [6]. The degree of success has been closely associated with the quality of the seed. As seed is a relatively costly item in total production costs, great care is taken over harvesting and storage. The seedbed area is ploughed deeply and cultivated with spring-tooth harrows, and the widths of paths and openings is designed to accommodate the root pruner in the following year. About 10 days after sowing, a 'Hawk' burner operating under high pressure is moved over the beds, and weeds are destroyed without harming the germinating seeds. This simple operation was found to cut weeding costs by approximately one-half. The root pruner, which is pulled by a caterpillar tractor, eliminates transplanting and has cut the cost of planting-stock by more than 50%. Half a million trees, it is claimed, can be root-pruned per day, the resulting stock being indistinguishable from ordinary transplants. A detailed account of a German machine called 'Radex' [7] also bears out the cheapness of the method. The 'Radex' closely resembles a small cultivator with two circular knives mounted so as to form an acute angle when their lowest points touch. Two types have been evolved; a heavy machine (knife diameter 50 cm.) drawn by a horse, and a lighter one (knife diameter 40 cum.) drawn by two men. Evidence based on large-scale experiments during 1934–39 under the

auspices of the A.T.F. (German Committee for Technical Forestry Matters), the Eberswalde Botanical Institute and the Reichsforstamt, is submitted to show that (1) in the case of large nurseries the use of 'Radex' is cheaper than lining out, and (2) under-cutting with 'Radex' produces more vigorous plants than does transplanting.

The experience of the Tennessee Valley Authority at its Muscle Shoals forest nursery, where 11 million Southern Pine seedlings are produced annually, showed the necessity for reducing weeding costs if total production costs of seedlings were to be cut down [8]. A mechanical weeder with 7 units to cover 42% of the spaces in an 8-row seedbed was developed and this not only cut the total man-hours on weeding by nearly 41%, but also produced better seedlings by improving growing conditions in the seedbed.

Russian literature on nursery work shows that considerable attention is being devoted to suitable implements for large-scale nurseries. A publication by D'yakov [9] describes some nursery implements including a cultivator with 4 ridging-type plough members mounted abreast for making beds, 3 types of horse-drawn seed drills, and implements for preventing soil crusting.

Toumey [5] describes transplanting work done by adapting the 'New Idea' tobacco transplanter, and by a transplanting machine invented by H. C. Turner of the Beal Nursery. For a similar purpose, Hildebrand in 1943 mentioned the adaptation of a celery planter [10] that might soon displace transplanting boards on sandy soils. Survival rates appeared to be satisfactory and it appeared that transplanting costs could be considerably reduced.

Some of the current problems of nursery practice in Britain and how they are being tackled by the Forestry Commission, are reviewed by MacDonald [11], who emphasizes the advantages of speed of work in an uncertain climate and refers to successful lining out with the use of the Robot cabbage planter. He believes that steam sterilization is a method of some promise in the costly task of keeping down weeds, and at present rapid scorching by the flame-gun is proving of immense importance. There are also great hopes for suitable multiple-row cultivators. The technique, so widely adopted in America, of using trains of implements to do several distinct operations together is one which has great possibilities. In this connexion Allen, in America, describes [12] how an International Harvester Company Farmall 'A' tractor was adapted to make a compact one-man unit for side-hoeing seedlings and working fertilizer into the soil in one operation and also to do 60% of the nursery weeding, and, with a trailer-type pressure spray and boom attachment, to spray 3 rows of seedlings at a time. The unit is less tiring than the trailer-type cultivator and causes less mechanical injury to the seedlings. In an 8-hour day the tractor uses about 4 gal. of petrol, cultivates and fertilizes an average of eighty 4 × 500-ft. seedbeds or sprays a total of 6 million seedlings and transplants. Brener [13] describes a multiple-use sprayer, for use in forest nurseries, which has been built up on a 1½-ton lorry chassis. The spray of liquid fertilizers, insecticides, or soil disinfectants is delivered between the rows of seedlings, thus minimizing danger of scorching. According to the experience of the Wisconsin Central State Forest Nursery, the sprayer can treat 400 standard seedbeds per hour or about 4 acres per day and its use has greatly decreased costs.

Transfer of Planting Stock (Storage and Packing).

Not the least interesting practices in the nursery are the methods of lifting, packing and storing of the plants: and the British Columbian experience to which reference has already been made [6] shows how the root pruner, equipped with a broad slightly tilted blade, cutting at a depth of 8 ins., is utilized as a lifter. Men following the machine tie the plants in bundles of 100, and using a simple box-like packing machine, bale them in heavy wax paper and wet peat mull, 4,000 plants at a time. Several advantages are claimed for the baling system; (1) the operation is very rapid—an experienced packer and assistant can pack 100,000 trees per day; (2) the bundle can stand very rough handling without damage to the plants and (3) the bales can be stored in a cold cellar at a steady temperature of 41° F. and held for two weeks before despatch. Stock in the cellar can also be heeled in and stored for an even longer time. Thus large quantities of planting stock can be sent off at short notice whatever the ground conditions at the nursery. This kind of service illustrates some of the great possibilities of large-scale centralization.

Such service also fits in with other aspects of mechanization of artificial regeneration. Russian experience [14] has shown the need for producing stock of standard size for use with planting

machines, and if plants are graded at the baling stage this object is conveniently secured. Toumey [5] quotes examples of machines which can grade approximately 500,000 and 100,000 seedlings per day, while Robbins [15] gives an illustrated description of a grading machine and an electric tying machine which together graded and tied 1,540,000 seedlings in bundles of 50 during 15 nine-hour days. The team used for lifting and transporting seedlings to the machine, grading, tying and supervision was equivalent to 12½ men and averaged 8,200 trees per man-day, lifted, graded and tied ready for packing.

Preparation of Site.

The relative costliness of preparing the site is often the crucial factor in decisions to promote forestry. Foresters are, therefore, likely to be on the alert for any method which will cheapen and facilitate this operation. But for the great scope and efficiency of mechanized and other methods, the increased cost of hand and other established practices would have rendered many areas uneconomic or sub-marginal for forestry. It might, indeed, be claimed that the economic efficiency of mechanization has opened up many areas for forestry which were previously regarded as too difficult. At the same time it is obvious that more experience is required of the application of the most suitable techniques. Initial cheapness is not always the paramount criterion and judgment on mechanization should consider the later development of the growing forest. Løfting of Denmark has done this to a certain extent and has examined the relatively long and intensive cultivations involved in the planting of heathland [16].

A useful generalization made in a Dutch investigation [17] was that standard figures for costs, and advantages of any particular technique, may never be available because combinations of soil types, ground cover, and obstacles were so diverse that each case had to be considered on its merits. For Scots Pine it was estimated that f. 200–250 per ha. (£7·2–9·5 per acre) was the maximum which could be spent on site preparation and even with the State subsidy of 50% of costs for such work, it would be uneconomical to use manual labour unless timber prices rose.

(*a*) *Stump removal.* On many forest areas full scope for mechanization implies freedom from stumps, and detailed descriptions of the various removal methods appear frequently. The Ministry of Agriculture in Britain has published an illustrated bulletin on the subject [18]. Two Danish reviews including one of 67 references, mainly German, cover the subject under: object; properties of stumpwood; method, including grubbing by hand and machine, blasting, and uprootal of whole trees; uses of stumpwood; influences on pests, diseases and the soil; and profitableness of the operations [19, 20]. In Russia the relative efficiency of horse machines, hand machines and hand tools has been studied on a time and production basis, and in comparison with tractor methods it was shown that these were respectively 1·81, 2·3 and 2·6 times less effective [21]. A German publication [22] describes two effective methods of stump removal using the explosive donarite. In the first, the charge was applied to the tap root in the ground, and in the second, the whole tree was pulled over with the help of a grubbing machine of the Waldteufel type before applying the charge to the stump. The total cost of extracting a stacked cu.m. by these methods was estimated respectively at R.M.10–14 and R.M.2·4–2·7. As well as being cheap, the second method left the ground in good condition. Explosives have also been tried in Holland [23] for breaking up gravel and iron pans at a recommended spacing of 5 m. Costs were estimated at f.175 per ha. (£6·6 per acre)—boring and filling of 400 holes, f.80; 5 kg. explosives f.56; firing and inspection, f.30; and contingencies f.9. From America comes a report [24] about an effective 'tree dozer' capable of removing trees up to 18 in. in diameter. By welding a 1-in. steel plate to the top of the blade of an ordinary bulldozer a considerable increase in leverage is possible.

(*b*) *Ploughs and cultivators.* Demonstrations and trials have proved useful for testing the suitability of machines for local and specific purposes. Following trials on clear-felled sites in Norrland, Sweden [25], suggestions were made about appropriate specifications for tractors and forestry cultivators as follows: weight, about 4 tons; width between tracks, 120–130 cm.; high clearance; steel protection of the undercarriage; extra-strong, easily repairable tracks; heavier springs; no mudguards; and the provision of winch equipment. At these trials it was estimated that the cost of cultivating and sowing by tractor methods was Kr.46 per ha. (£1·3 per acre) compared with Kr. 140 per ha. (£3·9 per acre) for manual cultivation of sowing strips.

Many different forms of plough and other implements have been tried and criticized in Europe [26, 27]. Holland carries out much deep cultivation for regeneration areas having soil pan, but for shallower working the chief types of implement are disk-ploughs, forest (ridge-type) ploughs, disk harrows and rotary tillers. Useful work has been done on ground with lightish cover and between rows of young plantations by a light forest plough designed by Geerling [28]. Geerling's implements, however, were too light for deep humus carrying much *Vaccinium*, heather etc. For sites that are not too much overgrown, two disk-harrowings at right angles are suggested. On land with widely spaced stumps and not heavily overgrown, the disk-plough has proved its worth, but costs exceed f.100 per ha. (£3·8 acre) as the ground has to be worked in different directions. Apart from Geerling's plough for cultivation in young plantations, if the cover is fairly light either the 'bosegel' (a narrow cultivator with 3 spring teeth) or rototillers, e.g. the multi-purpose Howard Rotary Hoe, are recommended.

In Britain big advantages are claimed by Denman and Faulkner for deep ploughing under moorland conditions [29, 30]. The latter describes the R.L.R. Forest Plough which, apart from the physical effects such as aerating the soil, completely breaks up the pan, eliminates weeds and root competition, and lessens fire risk. The chief disadvantage is the width of the furrow. In Denmark a plough with subsoiling attachments designed to prepare lean field soils for planting, has given good results where the hardpan is not too deep [31].

Some of the systematic studies on the influence of various methods of soil cultivation on the subsequent development of trees are relevant here since many of the favoured methods imply considerable scope for mechanical cultivation. Where, for instance, great depth of ploughing or subsoiling is recommended the essential power can only be achieved economically by mechanization. The general need to keep weeds in check by frequent and thorough cultivation and, in certain soil formations, for raising the planting site into ridges also point the same way, as indicated in the publications of Wagenknecht and Krahl-Urban [32, 33], and also of Jansen [34].

Sowing and Planting.

(*a*) *Direct sowing.* In efforts to reduce establishment costs, the method of direct sowing has been widely adopted. Geurken [35] advocated three different methods of direct sowing to meet the effect of the 125 to 150% rise in wages in Holland during the war.

In the United States, particularly at the Northern Rocky Mountain Forest and Range Experiment Station, many direct-sowing investigations have been made and qualified support has been given to this method [36–40]. Factors influencing success include stratification of the seed and its protection from rodents by poisoning or screening. Investigations by the Appalachian Forest Experiment Station [41] have shown that some of the treatments necessary to ensure adequate germination may prove to be more costly than normal planting methods. Success depended on adequate moisture, and the general conclusion was that while direct sowing might succeed on some sites in some years, none of the methods tested could be recommended as an economic substitute for, or as large-scale supplement to, planting.

Appropriate direct-sowing tools have been produced to meet the requirements of forestry. The Oregon State Forestry Department in 1945 developed a corn-planter type of sowing gun, weighing only 5 lb. [42, 43]. Field tests have been encouraging and the tool is capable of being used effectively and speedily on difficult ground. One man can cover 2 to 3 acres per day. Priaulx [44] gives the cost of operating a direct-sowing tool as $3–4 (£0·75–1) per acre, at the wage rates of 1946. Petterham of the Soil Conservation Service describes [45] an adaptation of the potato planter for seed spotting of Walnut, Hickory and similar large-seeded species. Apart from a reduction in sowing costs, the tool gives a uniform and optimum depth of sowing.

(*b*) *Planting methods and machines.* With a great expansion in most countries of afforestation and regeneration by artificial methods a considerable literature, particularly American, on suitable planting methods and machines has grown up. The cost of planting is relatively great in the total outlay of plantations. Since, however, it is usually done on a regular and even spacing there is some scope for replacing more time-consuming hand methods by machine work.

Whatever the method of planting there is need to discover the most satisfactory way of inserting the plants. This links up with questions of survival rate and subsequent growth. A Wisconsin study [46] with Pine seedlings showed that best results were obtained in furrows, especially the deeper furrows. Slit planting gave the poorest results, while careful and expensive spade planting failed to produce results better than those of any other method except slit planting. The contention in Michigan [47, 48] that slit planting produced satisfactory plantations at less cost than hole planting, was qualified by the fact that initial cheapness did not necessarily indicate final cheapness.

(i) *Hand tools.* In certain Swedish conditions the combined use of a 'boring spade' and a mattock has proved very successful [49, 50]. Two men and a younger planter can mattock-hoe patches 50 cm. × 50 cm. and plant about 800 2–2 Spruce per 8-hour day on hard stony soils or 1,000–1,200 (including mattock work) on easier ground.

Numerous one-man planting tools have been described, and their achievements can be judged by the criteria of speed as well as of survival and growth. One such is the American 'Miller' tree planter [51, 52], which sets out 1,400 seedlings in one man-day compared with about 500 by the normal hand-hoeing method. In 1946 a check of results showed that the tool was about 14% faster than the grub hoe, with slightly better survival on northern slopes but with significantly poorer rates—83 compared with 94%—on southern. At present the view is that the Miller tool holds some promise, but the best way to use it has still to be determined. Priaulx [53] gives cost performance of a planter which can plant 200-tree seedlings per hour, which is twice the ordinary rate. In Germany, the 'Saurus' spade, weighing 4·2 kg., can be used in suitable soil to give a kind of horizontal notch at a rate which is slightly faster than for pit planting [54]. Performing a somewhat different function is the Danish tubular planting tool [55] designed for lifting 1- to 2-year-old Beech wildings with a cylindrical 'ball' and for making planting pits of the same size to receive the ball-plants, thus practically eliminating root damage.

(ii) *Machines.* Most accounts of planting machines relate to experience in the U.S.A. Several publications have described outstanding planting performances by tractor-drawn machines, amongst which are:—(1) 10,000 trees per day by the Lowther tree planter, specially designed for cut-over land covered with heavy roots and old stumps; it works satisfactorily on all types of soil and on slopes up to 30% [56]; (2) 9,000 seedlings in eight hours, by a tree-planter designed by the Waldron Machine Works in Georgia for planting old fields and open land. Mounting the planting device on a large tractor achieved the necessary flexibility for dodging stumps [57]; (3) the U.S. Forest Service designed a machine similar to a vegetable plant setter with a daily planting rate of 8,000 trees or shrubs and a survival rate equal to hand planting. Mounted on a unicarrier, it requires two planters plus the tractor driver [58]; (4) the Michigan State College 'Reforestator', capable of planting 10,000 plants or more in 8 hours [59]; (5) the Champion Sheet Metal Company's two models—(*a*) the 'Simplex' model which can plant about 1,000 trees per hour at (in 1944) a cost of $2·30 (11*s.* 6*d.*) per thousand and (*b*) the 'Duplex' model which can plant 2,000 per hour at $1·50 (7*s.* 6*d.* per thousand, including tractor hire. Both models have been tried on a variety of soils and species and with plants averaging from 1 to 4 years' old [60]; (6) a 500-lb. inexpensive, easily transported machine designed by the U.S. Forest Service for use in planting windbreaks and shelterbelts. With one planter and one tractor driver it can plant 600 to 1,000 trees per hour in ploughed land [61]; (7) the 'Badger' planting machine from Wisconsin enables 2 men to do work previously requiring 10–12 men. It was found that 2–2 stock gave best recovery and survival for Norway Spruce and 2–1 stock for Jack Pine, as 2–2 was too large. The survival on machine planting has been very high, the lowest percentage survival over a three-year period being 87% and the highest 96% [62].

There is little information about the capital cost of these machines but the fact that many of them can plant in one hour what normally takes a man a whole day provides obvious scope for mechanizing the important operation of planting and providing satisfactory survival rates at the same time. The general principles of design in mechanical tree planters has been reviewed in the *American Journal of Forestry* [63]. This article stressed that where tree-planting machines worked on the principle of opening a continuous furrow they faced the limitations set by stoniness, steepness, large tree roots and stumps, and heavy colloidal content of soils. Nevertheless, there were many areas not affected by these limitations where machine planting would be considerably cheaper than hand methods.

In support of this view the following figures were quoted for areas of just under 200 acres planted in each of three years, the first by hand planting after tractor-ploughing, the others by the Wisconsin machine:—

Costs per acre (of 1,076 trees)	1944 *Hand planting*	1945 *Machine planting*	1946 *Machine planting*
	$	$	$
Labour	5·52	1·36	1·76
Tractor hire and operation	1·67	2·57	2·74
Depreciation on machine	—	0·41	0·41

In the latest type of machine the depreciation was estimated conservatively at 25 cents per 1,000 trees. As there was a substantial rise in wages between 1944 and 1946 the 1944 hand labour costs should be increased by about 35%, i.e. to $7·45, for better comparison with the 1946 machine planting. A scheme exists in Wisconsin for hiring these machines to owners of land suitable for machine tree planting. It was found that a minimum planting of 5,000 trees justified their use.

There are occasional references to aspects of mechanization in Russia and a German source gives a brief illustrated description [64] of a Russian planting machine (Type LP1) used in large-scale planting of Pines. In Russia emphasis has been laid on standardization of planting stock for use with planting machines [14]. On sandy soils it was found that the root system of nursery stock was too long in the second year and the raising of one-year stock for machine use was recommended.

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ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in other languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. BIBLIOGRAPHY. MATHEMATICAL AND STATISTICAL ANALYSIS

See also *For. Abstr.* 10 (No. 793).

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02. DICTIONARIES AND LISTS OF VERNACULAR NAMES

See also *For. Abstr.* 10 (Nos. 83, 116, 254).

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05. PERIODICALS

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To be published twice a year.

[5]. 05.3 (564.3). WATERER, R. R. **Cyprus: Report of the Forest Administration for the years 1939–1945.** Govt. Printing Office, Nicosia. 1948. pp. 16 + 14 tbls.

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07. EDUCATION AND RESEARCH

See also *For. Abstr.* 10 (Nos. 247–8, 822).

[7]. 07.1 (945). FERGUSON, K. V. M. **Non-professional forestry training in Victoria.** *Aust. For.* 11, 1947 (52–6).

[8]. 07.2 (44 : 213). MARCON, Y. Organisation en France des recherches techniques se rapportant aux forêts et aux bois tropicaux. [**The organization in France of technical research on tropical forests and timbers.**] *Bois For. Trop.* 4 (4), 1948 (10–19 + 5 photos). [F.]

An account of the 'Section Technique Forestière' of the Station d'Essais at Nogent, and suggestions for its transformation into an institute for the study of tropical forestry and forest industry.

[9]. 07.2 (56 : 53 : 55 : 612 : 62 : 624 : 63 : 677) : 02.5 : 91 : 90. WORTHINGTON, E. B. **Middle East science: a survey of subjects other than agriculture.** H.M. Stationery Office, London. 1946. pp. xiii + 239 + maps. 198 refs. Price 7*s*. 6*d*.

This detailed study of the physical environment of the Middle East populations, with emphasis on the inestimable importance of water supplies, stresses the need for systematic consideration of basic problems and suggests numerous points of attack where scientific research would bring results of practical value. Pp. 91–110 deal with forestry. In most of the area under review, the forests have been destroyed over a long period by cutting, grazing, and browsing, with resultant soil erosion, formation of sand dunes, etc. The untethered goat is a chief trouble in the northern countries. Progress towards its ultimate replacement by the more productive tethered goat might be more rapid were it

recognized that, from the pastoralist's point of view, the goat is pre-eminent in most of the attributes desirable in a domestic animal living in hard conditions.

The need is emphasized for detailed scientific study of the erosive process and the degree to which soil is lost under different conditions of vegetation, grazing, and cultivation. Up to now, such studies have been few and on a very small scale. The three chief methods of re-establishing forest, namely natural regeneration, sowing, and planting, and the special problem of sand-dune fixation, are discussed and the importance of village fuel and pole plantations is stressed. There is need of more trained personnel, and it suggested that Cyprus, which has a fair amount of natural forest left, would be a suitable site for a training centre for junior grades of forest officers.

[10]. 07.2 (728 : 729). **Forest research within the Caribbean area.** Caribbean Commission and Caribbean Research Council, Washington. 1947. pp. x + 128. 276 refs.

[11]. 07.2 (931). **Forest experiment station.** *N.Z. J. For.* 5 (4), 1947 (266).

During 1947 the New Zealand Forest Service set up a Forest Experiment Station at Rotorua, which will be closely associated with the existing Training Centre and proposed Forestry School. The immediate aims of the station are to examine and co-ordinate current experimental work in the Conservancies, rather than to initiate new research projects. The programme includes:—(1) testing existing volume tables and compiling new ones where necessary; (2) designing the most effective method of assessing exotic forests; (3) studying the formation of heartwood in *Pinus radiata*; (4) investigating the possibilities of vegetative propagation of conifers; (5) forming a forest herbarium and arboretum; (6) routine testing of tree seed and the study of the cotyledon and seedling characteristics of indigenous trees and shrubs; (7) mycological and entomological work, including a pathological study of *Nothofagus* and an enumeration of all insects and fungi occurring in exotic forests; (8) an ecological study of the invasion by indigenous shrub and tree species of exotic stands; (9) the direction and collation of phenological observations already being made throughout the country. The National Forest Survey now becomes a project of the Experiment Station. When facilities allow, all forest products research will come within its scope.

[12]. 07.2 (94). RODGER, G. J. **Research work in forestry and forest products in Australia.** *Unasylva* 1 (3), 1947 (21–7).

[13]. 07.5 (747) : 09.1. HOSMER, R. S. **The Cornell plantations: a history.** The Administrative Committee of the Cornell Plantations, Cornell University, Ithaca, N.Y. 1947. pp. xiv + 209 + plates + end-plate map.

[14]. 07.5 (797). MUNGER, T. T. **The Wind River Arboretum from 1937 to 1946: progress report No. 3.** Pacif. Nthwest. For. Range Exp. Sta. 1947. pp. 21 + 8 photos.

09.1. *Forest History*

See also *For. Abstr.* 10 (Nos. 13, 824).

[15]. 09.1 (941). **Historical review (1829–1947).** *Rep. For. Dep. W. Aust.* 1947 (4–7).

09.4. *Forest Statistics*

See also *For. Abstr.* 10 (Nos. 636-7, 807).

[16]. 09.4 (431–5) : 09.7. RITTER, E. **Forests in Western Germany.** *J. For.* 46 (4), 1948 (263–6).

Includes statistics of productive forest areas of Greater Hesse by ownership and species or types, and an inventory of growing stock (volume by products of all trees over 7 cm. d.b.h.).

[17]. 09.4 (47) : 32 : 33. Lesnaya promȳshlennost' za 30 let. [**The forest industry in the past 30 years.**] *Lesnaya Prom.* 1947 (10), (5–14). [Russ.]

A historical review, with special reference to the period 1928–40 in order to illustrate the increasing improvements effected by the first three 5-Year Plans of 1928–32, 1933–37 and 1938–40 (interrupted by war), under the headings: logging operations; sawmilling; woodworking and furniture industry; the match industry; the forest chemical industry; construction of machinery and vessels; capital investment. Partial statistics are given under each head.

Between 1932 and 1940 the total annual production by value, of the enterprises under

the People's Commissariat of the Forest Industry, rose from 1709·7 million to 2131·9 million roubles, notwithstanding the fact that during this period 129 logging enterprises and 119 factories were transferred to other hands. The industries employed 59% more workers in 1940 than in 1927. Between 1932 and 1940 the average annual output per worker rose by 57% (factory workers by 91%, logging workers by 30%). Average yearly earnings of factory and logging workers increased over the same period to respectively 2·7 and more than 4 times the 1932 level.

[18]. 09.4 (498). JANGOCI, E. Exploatarea pădurilor şi industria lemnului în 1947. **[Forest exploitation and wood industry [in Rumania] in 1947.]** *Rev. Pădurilor* 63 (1), 1948 (5–8). [Rum.f.]

Forest area in Rumania amounts to 6,326,856 ha., of which 25% is owned by the state, 42% by corporations, and 33% by private persons. Of this area, 73% is managed as high forest and 27% as coppice; 1,150,092 ha. are occupied by conifers and 4,824,764 ha. by broadleaved species. Beech occupies 41% and Oak 23% of the total forest area. The annual forest production is estimated at 3,000,000 cu.m. of softwoods, 5,720,000 cu.m. of Beech (87% firewood), 1,900,000 cu.m. of Oak (66% firewood), 2,290,000 cu.m. other hardwoods (96% firewood). The forest industry possesses 1,300 saws, of which only 850 are actually in use.

[19]. 09.4 (560). HEITMANN, F. Statistische Grundlagen der forstlichen Verhältnisse Asiens: zur Forst- und Holzwirtschaftsstatistik der Türkei. **[Statistical bases of the forestry conditions of Asia: statistics on forestry and the timber trade in Turkey.]** *Z. Weltforstwirt.* 11 (4/9), 1944 (283–93). 22 refs. [G.e.f.]

[20]. 09.4 (663). BELLUARD, M. Accroissement de la production forestière au Sénégal. **[Increase in forest production in Senegal.]** *Rev. int. Bois* 14 (126), 1947 (219–21, 225). [F.]

Gives figures for production of firewood and charcoal, number of trees felled, forest area, and area reforested, for the years 1937–47 inclusive.

[21]. 09.4 (97) : 35 : 98. **Empire forests and the war. Statistics prepared for the Fifth British Empire Forestry Conference, Great Britain, June, 1947.** H.M. Stationery Office, London. 1948. pp. 18. Price 1*s*.

A final edition with additions and revisions, of the digest issued to the Conference in 1947. [Cf. *For. Abstr.* 9 (No. 715).]

09.7. *Monographs of Individual Forest Regions*

See also *For. Abstr.* 10 (Nos. 90, 92, 95, 845).

[22]. 09.7 (44) : 96.5. [ROL, R., POURTET, J., DUCHAUFOUR, P., and DUVAL, M. A.] Notes forestières sur la Bretagne et le Cotentin. **[Silvicultural notes on Brittany and the Cotentin.]** *Ann. Éc. Eaux For. Nancy* 10 (3), 1947 (263–303 + map + 18 photos). 6 refs. [F.]

Describes the topography, climate and soils of the region, existing forest types and common tree species, and the 'landes'. Possible use of exotics for afforestation is discussed. It is concluded that improvement of existing, degraded hardwood forests should be undertaken before afforestation of the landes.

[23]. 09.7 (45). URQUHART, B. **The forest problems of Italy.** *Ctry. Life, Lond.* 101 (2624), 1947 (814–5). O.B.

A brief review of the Italian forest and forest problems with some suggested solutions. Italy possesses more than 14,000,000 acres of forest land, yet imports a large proportion of her timber. For example, more than 250,000 tons of pulp were imported annually in normal times for the paper and rayon industries. The bulk of forest land (66%) is privately owned. The State possesses 3% and communes 31%. The splitting up of large estates has tended to introduce lower standards of management and 50% of the forests are managed as coppice. More than 7,000,000 acres are cut over on short rotations to produce fuel and minor products.

[24]. 09.7 (47). BUCHHOLZ, E. Die Wald- und Holzwirtschaft des Ostraumes. **[The forestry and timber economy of the Ostraum [essentially Russia].]** 'Die Bücherie des Ostraumes'. George Leibbrandt, Berlin. 1943. pp. 270. 95 refs. [G.]

This book, an expansion of the author's *Die Wald- und Holzwirtschaft Sowjet-Russlands* (1932) and prepared 'for official use only',

consists of 5 sections. (1) The natural features on which forest and timber management are based (includes forest areas, resources, and increment, vegetation zones and forest types, and the forest as a factor in climate). (2) Forestry and timber economy (with an account of German influence, the development under Soviet rule, recent forest legislation, forest administration; training; management and survey; protection; silviculture and regeneration). (3) Fellings and the utilization of forest produce (timber cut, consumption and demand; transport and industries; minor products, e.g. resin, stumpwood tar, charcoal, Lime bast, tanstuffs, Birch and Maple sap, rubber and guttapercha, sericulture; and bog Oak; also sections on certain important tree species; timber export figures, by categories, from 1930 to 1938 and German imports; and on Soviet plans and reality). (4) Observations on the forestry and timber management of 9 regions of the U.S.S.R. (5) Sport and wildlife protection.

The illustrations and diagrams include 9 sketch-maps, and a long bibliography, chiefly Russian.

[25]. 09.7 (472). Pervozvanski, I. V. Lesnaya promÿshlennost' Karelo-Finskoy SSR v poslevoennoy stalinskoy pyatiletke. **[The forest industry of the Karelo-Finnish S.S.R. in the post-war 'Stalin' 5-Year-Plan.]** *Lesnaya Prom.* 1947 (11), (3–5). [Russ.]

Forests cover 61% of the Karelo-Finnish S.S.R. The total growing stock is estimated at about one thousand million solid cu.m., the greater part in mature and overmature stands, and is regarded as ample for any cutting that is likely to take place. Traditionally, the northern portion of the region has been practically inaccessible, while the southern, where a number of sawmills were operated, has been fairly heavily cut. The bulk of the forest is therefore in parts which are still remote from the railways. Production of timber increased considerably after the revolution; woodworking industries grew up, sawn timber was produced for export, and a paper mill established. The second world war destroyed or put out of action all the factories in the operational zone and greatly depleted the working population. Six State logging concerns operate within the region. In order to meet the expansion called for by the current 5-Year Plan, clear felling will replace the former selective logging, and it will be necessary to secure large numbers of electric saws and power units, tractors, trucks and locomotives, and considerably to extend roads and railways. In spite of mechanization, however, the labour shortage will remain a major problem. All possible steps are therefore being taken to improve the workers' living conditions and thus to secure a permanent labour force in the region [cf. *For. Abstr.* 10 (p. 149)]. Some notes are included on the location of forest industries in relation to supplies and communications.

[26]. 09.7 (494) : 2. Rodger, G. J. **Swiss forestry.** *Aust. For.* 11, 1947 (7–14). 2 refs.

[27]. 09.7 (494). Däniker, A. U. [Editor.] Über die Bedeutung des Schweizerwaldes. **[The importance of the Swiss forests.]** Schweizerischer Bund für Naturschutz, Basel. 1945. pp. viii + 181. [G.F.]

A collection of articles dealing with various aspects of the Swiss forests. The importance of the forests in Switzerland, the forest soils, the influence of the forests on the water régime, the history of their administration, their economic, social and industrial importance, legislation and management, their rôle during the war and in the future are all considered in separate studies by the following authors:—C. J. Bernard, H. Burger, A. V. Däniker, R. Gallay, C. Gonet, H. Grossmann, H. Gutersohn, E. Klöti, H. Knuchel, A. Küng, H. Leibundgut, K. A. Meyer, A. J. de Morsier, M. Oechslin, H. Pallmann, F. Porchet.

[28]. 09.7 (497.1). Osipov, N. Lesnaya promÿshlennost' Yugoslavii. **[The forest industry of Jugoslavia.]** *Lesnaya Prom.* 1947 (11), (24). [Russ.]

Stresses the importance of forests in the national economy of Jugoslavia, briefly sketches the vegetation of the country and commends the progress made in recovering from the damage done by the war. It is officially stated that, of 2,281 small sawmills, 900 were damaged and 780 completely destroyed during the war, and of the large sawmills 80% were put out of action. By the end of 1945 about 130 large sawmills were at work again and their output practically met domestic needs; since that date it has been considerably raised.

[29]. 09.7 (52). GRAYBURN, A. W. **Japan's forests.** *N.Z. J For.* 5 (4), 1947 (302–9). 3 refs.

Cf. *For Abstr.* 8 (No. 874).

[30]. 09.7 (542). RATURI, P. D. **Industrial survey report of Tehri Garhwal State.** *Indian For.* 73 (11), 1947 (479–86).

[31]. 09.7 (68). **Forests and fisheries [of the Union of South Africa].** *Prepr.* from *Official Yearbook of the Union of South Africa 1946*, 1947. pp. 10 + 8.

[32]. 09.7 (72) : 60.3 : 76.4. MARTINEZ, J. G. Desarrollo y utilización de los recursos forestales. **[Development and utilization of forest resources [in Mexico].]** *Rev. agric., Guatemala* 2 (21/26), 1946 (410–18). [Span.] E.M.B.

[33]. 09.7 (729.4) : 90. **Forest conditions in Haiti.** Food Supply Division, Institute of Inter-American Affairs, Washington, D.C. 1945. pp. 24.

[34]. 09.7 (81) : 33.17 : 31.0. **The coastal forests of central Brazil.** *Wood* 13 (2), 1948 (37–9).

The coastal forests of Brazil, stretching from a little north of Rio de Janeiro to Bahia, cover an area nearly as large as England and Wales together. The sawmilling industry is not yet highly organized and consists of some hundred mills, mostly small, which are mainly concentrated along the railway running inland from the port of Victoria. The transport situation is better in this region than in the rest of Brazil for transport lines are short and can be supplemented by coastal freighters. Peroba do Campo (*Paratecoma*) Jequitiba (*Cariniana legalis*) and Jacaranda (*Dalbergia* or *Machaerium*) are the most important export timbers of this area.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

See also *For. Abstr.* 10 (No. 61).

11.14. Precipitations. Evaporation. Humidity

[35]. 11.14.3 : 07.7. MACLEOD, J. C. **Evaporation in rain gauges.** *For. Chron.* 24 (1), 1948 (87–8).

Tests on 3-in. and 5-in. types showed that even during a comparatively cool season there was an appreciable evaporation loss from untreated rain gauges, especially from the 3-in. type. When a small amount of kerosene is used in the gauge receptacles, no appreciable evaporation loss occurs in either type of gauge.

11.4. *Soil*

See also *For. Abstr.* 10 (Nos. 155, 805).

[36]. 11.4 (213). EDEN, T. **Elements of tropical soil science.** Macmillan & Co., Ltd., London. 1947. pp. vii + 136. Price 5*s*.

A text-book of soils, manures, and agricultural chemistry in general, which has been written especially for those concerned mainly with agriculture in the tropics. There is the necessary minimum of theory, but as much room as possible is given to practical applications. It contains chapters on soil formation; physical properties; chemical properties; green manuring and composting; cultivation; soil erosion and drainage; fertilizers and their use; field experiments.

[37]. 11.4 (88 : 729). HAMILTON, R., and SESSELER, W. M. Bijdrage tot de bodemkundige kennis van (Nederlandsch) West-Indië. **[Contributions to the pedology of the (Dutch) W. Indies.]** *Meded. ind. Inst. Amst.* No. 63 (*Meded. HandMus. ind. Inst.* No. 29), 1945. pp. 58 + 6 photos, 3 tbls., 5 sketchmaps, 87 refs. [Du.du.e.]

[38]. 11.4 : 33.38 : 12.11.2 : 12.25. TRYON, E. H. **Effect of charcoal on certain physical chemical, and biological properties of forest soils.** *Ecol. Monogr.* 18 (1), 1948 (81–115). 73 refs.

The following factors were studied on brown podzolic forest soils from Connecticut: moisture absorption by charcoal; effect of charcoal on physical and chemical properties of forest soils; effects of charcoal on germination of White Pine [*P. strobus*] seed, and on growth, mycorrhiza and damping off of White Pine seedlings; effects of charcoal on soil microfauna. The

results indicated that the presence of charcoal in forest soils alters several of their physical and chemical properties, but that these changes have little influence on the development of conifer seedlings.

11.41. Soil Physics

[39]. 11.41.3 : 11.62 : 11.41.8. DREIBELBIS, F. R. **A summary of soil-moisture data useful in soil- and water-conservation investigations.** *Trans. Amer. geophys. Union, 1944*, 25 (6), 1945 (1041–7). 10 refs. L.S.

Summarizes some of the most important results obtained in soil-moisture investigations at the North Appalachian Exp. Station (Coshocton, Ohio). The following data on the moisture content of soil profiles to a depth of 40 in. are presented for woodland, pasture, cultivated Muskingum silt loam, and cultivated Keene silt loam respectively:—(1) Difference between maximum possible water storage and minimum field moisture actually found: 13·11, 11·09, 11·05, 8·80 in. (2) Maximum active soil water found: 9·60, 9·05, 8·49, 8·38 in. (3) Average of 34 monthly values of the available storage capacity: 7·01, 5·11, 6·15, 3·68 in.

11.43. Biology of Soil, including Mycorrhiza

See also *For. Abstr.* 10 (No. 229).

[40]. 11.43.1. SCHMIDT, E. L. **Mycorrhizae and their relation to forest soils [a review].** *Soil Sci.* 64 (6), 1947 (459–68). 40 refs.

[41]. 11.43.1. BALDACCI, E. Alcuni aspetti del rimboschimento in relazione al fenomeno della micorrizia. **[Some aspects of afforestation in relation to mycorrhiza.]** *Ital. for. mont.* 3 (2), 1948 (67–72). 7 refs. [It.]

A brief review of the subject, dealing mainly with British and American work.

[42]. 11.43.1 : 12.25 (46). ZAPATERO BALLESTEROS, E., and SAN JUAN, A. Trabajos de microbiología forestal y agrícola en la provincia de Valladolid. **[Work on forest and agricultural microbiology in the province of Valladolid.]** *Anales del Instituto Español de Edafología, Ecología y Fisiología Vegetal* 5 (1), 1946 (17–43). [Span.f.e.] C.G.B.

Preliminary results of investigations to compare the soil microflora of a Pine forest and that of land used for wheat cultivation. Climate, soil, plant population of the experimental areas near Valladolid, and outlines of the technique to be followed, are described.

[43]. 11.43.1 : 12.25 : 12.11.12 : 11.47.2 : 11.42.2. MØLLER, C. M. **Mycorrhizae and nitrogen assimilation.** *Forstl. Forsøgsv. Danm.* 19 (2), 1947 (105–208). 68 refs. [E.dan.]

Summarizes the author's hitherto unpublished studies, made at intervals from 1920 onwards, and reviews the result obtained by other workers in this field. The author's findings are as follows:—

(1) Both of the species studied (*Pinus montana* and *Picea abies*) have always shown typical ectotrophic mycorrhiza. The only intracellular hyphae found were those exceptionally penetrating and generally killing the outermost cortical cells.

(2) As reported by other workers, mycorrhiza develops most vigorously on active mors and least so on mulls and very poor mors.

(3) Various species of fungi contribute to the formation of the external fungus mantle. The poorer the site, the less exacting are the N requirements of the fungus species concerned.

(4) Non-mycorrhizal Mountain Pines showed surprisingly good growth on practically N-free media, as well as in waterlogged cultures with a minimum supply of O_2 to the roots.

(5) No genuine proof has yet been furnished of a special capacity of mycorrhiza for assimilating organic N compounds or of its representing a true symbiosis. It is still possible to interpret the occurrence of mycorrhiza-producing fungi on roots as a type of epiphytism. The saprophytic activity of bacteria and fungi is doubtless very important in litter decomposition, and this *may* be a sufficient explanation of beneficial effects attributed to mycorrhizal symbiosis.

(6) Repeated experiments with Mountain Pine cultured on N-free media, failed to provide evidence of any ability of mycorrhiza to fix free atmospheric N.

(7) Investigations of soils under about 40-year-old Mountain Pine, on adjacent heathland, under an isolated clump of Norway Spruce, and of blown sand, indicated that under

Mountain Pine there had been a mobilization of N and humus in the topmost 10 cm. of soil. The bulk of the mobilized N appears to have been used for the growth of the Pine and was found in the trees and their litter. No increase was ascertainable in the amount of N per unit area. The pore volume of the topmost 10 cm. of soil was rather greater, and density and water content (including that of hygroscopically fixed water) lower than those of the adjacent heathland. These differences did not extend below 10 cm. depth and were smaller than those between the soil under the Spruce clump and the blown sand.

(8) The beneficial effect of Mountain Pine on Norway Spruce heathland plantations is ascribed to the Pine's frugal use of soil nutrients, the mobilization of N in decomposing litter, dead roots etc., and the shelter provided for the Spruce.

[44]. 11.43.1 : 12.11.1 : 12.14.3 : 12.14.1 : 12.25. MACDOUGAL, D. T., and DUFRENOY, J. **Criteria of nutritive relations of fungi and seed-plants in mycorrhizae.** *Plant Physiol.* 21 (1), 1946 (1–10). [Cutter Laboratory, Berkeley, Calif.] O.B.D.

The determining features of nutritive relations between fungi and seed-plants are those of origin, flow and ultimate disposal of nutritive material. Alterations in tissue structure, cytological departures and modifications of metabolism are also a feature, but a minor one, in characterizing such relations. The author emphasizes that the nature of the association of two species should be assessed on cytological or cytochemical evidence rather than upon morphological characters, results of germination tests, aspects of life histories etc. Cytochemical methods of analysing the nutritive relations of mycorrhizal elements are elaborated. The chain of processes in which electrolytes and organic compounds are absorbed from the soil, elaborated into proteins, carbohydrates and phospholipidic compounds conforms to a general pattern common to all mycorrhizae, but the anatomical engagement of the two symbionts shows the widest diversity. Morphological adjustments of Pine mycorrhizae are described. Morphogenic alterations, which have become transmissible by seeds, as in *Corallorhiza* (where the capacity for root formation has been entirely lost) are also discussed.

[45]. 11.43.1 : 12.25 (82) : 12.14.3. CASTELLANOS, A. Notas fanerogámicas, III. [**Notes on phanerogams, III.**] *Lilloa* 12, 1946 (205–10). [Span.e.] A.P.B.

Includes a description of the root tubercles of *Podocarpus parlatorei*.

11.44. Litter. Surface Humus

[46]. 11.44 (431–5 : 213). GROSSKOPF, [W.] Entstehung und wirtschaftliche Bedeutung des Humus in einheimischen und tropischen Wäldern. [**Origin and economic importance of humus in native and tropical forests.**] *Mitt. Reichsinst. ausl. kolon. Forstw.* No. 1, 1944. pp. 12. 13 refs. [G.]

[47]. 11.44 : 12.25. BARTHOLOMEW, W. V., and NORMAN, A. G. **The threshold moisture content for active decomposition of some mature plant materials.** *Proc. Soil Sci. Soc. Amer. 1946*, 11, 1947 (270–9). 9 refs. L.S.

The materials studied included alfalfa, Sudan grass, oat straw, hemp bark and *Pinus strobus* needles. The moisture content at which active decomposition of Pine needles began, at temperatures of 25 and 37° C., was 15–17%, and the relative humidity required was 80–86%. Increased temperature shortened the length of time before the peak rate of CO_2 evolution was reached.

11.45. Geological Conditions. Soil Surveys

See also *For. Abstr.* 10 (No. 96).

[48]. 11.45.4 : 12.11.11. WARREN, H. V., and HOWATSON, C. H. **Biogeochemical prospecting for copper and zinc.** *Bulletin of the Geological Society of America* 58 (9), 1947 (803–20). 43 refs. L.S.

Investigations on the relationship of plants to ore deposits, carried out in British Columbia, indicate that the zinc and copper content of some trees and plants may reflect the presence of zinc and copper concentrations in the underlying soils and rock formations. Cones and needles of *Tsuga mertensiana, Pseudotsuga taxifolia, Larix occidentalis* and *Pinus contorta* and leaves of *Echinopanax horridus, Alnus sinuata* and *Salix* sp. all have possibilities as indicators of abnormal amounts of copper or zinc in their vicinity.

11.47. Maintenance of Favourable Soil Conditions

See also *For. Abstr.* 10 (Nos. 228–9, 421).

[49]. 11.47.13 : 12.26–8 : 23.26.4 : 23.6. HITIER, H. La fumure du peuplier est-elle rentable? [**Is it economic to apply fertilizer to Poplar?**] *La Potasse* Dec., 1947 (186–8). [F.] *Abstr.* in *Rev. Eaux For.* 87 (2), 1948 (106–7).

Report on experiments in applying artificial fertilizers to Poplar cuttings in a nursery and to transplants in the field. The nursery treatment consisted of a preliminary application of 300 kg. of slag 16–18%, and 300 kg. of KCl 49%, and an application, immediately before planting, of 150 kg. cyanamide, or 120 kg. sulphate of ammonia, or 150 kg. calcium nitrate; also, in the 2nd and 3rd years, surface applications of 100–125 kg. cyanamide. The results at the end of 3 years, with cuttings of the variety 'Raverdeau à écorce blanche', were:—

G.b.h. (cm.)	*Untreated*	*Treated*
16–18	0	50
14–16	80	200
12–14	200	250
10–12	400	200
8–10	200	150
losses	120	150
Total	1,000	1,000

In the field experiments (156 plants/ha.) one kg. of a complete fertilizer (7–17–24) was applied to each tree in the 2nd and 3rd years. At 13 years the mean g.b.h. was 0·75–0·95 m., mean height of clear bole 18 m., compared with 0·50–0·70 m. and 15–17 m. respectively for untreated trees at 15 years. It is concluded that treatment is economically practicable in view of the increased growth rate and superior quality of timber obtained.

11.49. Soil Types

See also *For. Abstr.* 10 (Nos. 91, 93–4, 96, 98, 231).

[50]. 11.49.0 : 12.19.2 : 91.3. KUMAR DUTT, A. **The influence of forest types on the degree of podsolization.** *Indian For.* 73 (11), 1947 (495–8). 10 refs.

A short review article.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 10 (Nos. 9, 39, 177, 213–4, 232, 235, 835, 841).

[51]. 11.62.1 : 45.11 : 12.19.4 (564.3). CHAPMAN, E. **An analysis of the data obtained from the run-off plots at Halefka and Sykhari 1939–1944.** *Tech. Pamphl. For. Dep. Cyprus* No. 9, 1948. pp. 7 + 5 tbls.

The data of this experiment were derived from comparable plots, the only difference in treatment being that some were fenced against grazing. It was proved that, by protection alone, the quantity and quality of vegetation improves, the tendency being for the xerophytic species to disappear and the mesophytic species to come in. The results confirm the hypothesis that much of the aridity and semi-aridity in Cyprus is man-made.

[52]. 11.62.11 : 38.8. BENNETT, H. H. **Elements of soil conservation.** McGraw-Hill Book Company, Inc., New York and London. 1947. pp. x + 406. Price $3.20 (16*s.*).

[53]. 11.62.11. **Soil conservation, an international study.** *FAO Agricultural Studies* No. 4, 1948. pp. 189 + map.

A brief account of soil deterioration and some of the measures being taken in various countries of the world to correct the misuse of land Particular emphasis is laid upon soil erosion and its control. Most attention is given to China and the United States of America. There are 96 photographs.

[54]. 11.62.11 (545). GORRIE, R. M. **Countering desiccation in the Punjab.** *Repr.* from *Geogr. Rev.* 38 (1), 1948 (30–40).

[55]. 11.62.11 : 23. : 47. SMITH, C. M. **Functions of the forester in soil conservation.** *N.Z. J. For.* 5 (4), 1947 (278–84).

[56]. 11.62.11 (73) : 60.31.2. KELLER, J. W. **Forestry and soil conservation.** *J. For.* 46 (5), 1948 (340–3).

A brief summary of the organization and

work of the U.S.A. Soil Conservation Service, with special reference to farm woodlands.

[57]. 11.62.11 (79). DEPPA, J. W. **The formation and control of arroyos in the southwest.** *J. For.* 46 (3), 1948 (174–9).

The arroyos of the south-western U.S.A. represent some of the most serious gulley erosion in the country. The author analyses the different sections of a typical arroyo—(1) straight sector, (2) advancing bar, (3) cutting curve, (4) inner bar, (5) receding bar—and explains the indications of flood force to be found in deposits, scour marks, sandbanks etc., which identify the boundaries of the various sections. Once watershed control has been secured, with consequent reduction of flood crests, it should be possible to stabilize the whole arroyo by (1) bank protection immediately below the cutting curve and (2) inducing the advancing bar above the curve to travel downstream across the cutting sector to join with the receding bar; such a junction would cushion the original cut and prevent its further cutting and migration. Stabilization accomplished, the next and last operation would be to increase the roughness of the entire channel by continuous plantings and simple retardants, so as to secure a general reduction of velocity and the deposition of sediment.

[58]. 11.62.11 (79) : 23.21. SMITH, O. W., JACQUOT, H. D., and BROWN, R. L. **Stabilization of inland sand dunes in the Pacific Northwest.** *Bull. Wash. St. agric. Exp. Sta.* No. 492, 1947. pp. 16. 15 refs.

An area to study vegetative control measures in inland sand dunes was selected in 1939 near Delight, 15 miles south of Lind, in central Washington. The soil was a fine, yellow sand of lacustrine origin, of low fertility, and liable to movement even with light breezes. Annual rainfall averages 9 in. Herbaceous species tried included 10 grasses for initial sand-stilling and 26 for permanent stabilization. Eighteen accessions of woody species for permanent control were also tested.

Establishment of all species was by vegetative propagules. Grasses were planted in the fall, woody species in the spring.

Eighteen grasses out of 43 tested survived during the test period. Fourteen of these are strongly rhizomatous and propagate vegetatively. Nine of the strains surviving the test produce coarse vegetative growth that persists above accumulating sand.

Vigor and survival are closely associated. A coarse, vigorous *Elymus giganteus* strain, P–208, and *Ammophila arenaria* were the best sand-stilling grasses tested.

Native herbaceous species of forbs were not able to invade plantings of *Elymus* and *Ammophila*. Outstanding among invading species were *Elymus flavescens* and species of native *Astragalus* and *Oenothera*.

Elymus giganteus strain P–208, because of its characteristics of aggressiveness, longevity, and low palatability, may persist from the initial sand-stilling stage and give effective permanent erosion control on inland dunes. These qualities in a single grass can revolutionize inland dune control by eliminating at least one planting stage that has been essential for permanent control, and by insuring against the hazard of overgrazing and destruction of the vegetal cover by livestock and jack rabbits.

Three woody species of the six that survived the trials have demonstrated their value for permanent stabilization of inland sand dunes. These are, in order of importance: the New England strain of *Cytisus scoparius*, *Elaeagnus argentea*, and *Purshia tridentata*. *From authors' summary.*

[59]. 11.62.3 (73) : 91.3 : 12.11.14. HOOVER, M. D. **Effect of removal of forest vegetation upon water-yields.** *Trans. Amer. geophys. Union* 25 (6), 1945 (969–77). 7 refs. L.S.

Describes the methods and preliminary results of a pilot study of the effect of forest cover on streamflow, made in the Coweeta Experimental forest in the southern Appalachians. The plan of the experiment was to compare water yield before and after removal of the indigenous, mixed deciduous forest. Before cutting, sufficient streamflow and climatic records were obtained to establish the normal relationship between rainfall and run-off; a comparable, adjacent drainage area was left uncut to serve as a control. After the primary cutting, all sprout growth on the treated catchment was to be cut back for 5 successive seasons. In order to isolate the effect of transpiration, it was necessary to carry out the treatment in such a way that a minimum change in infiltration capacity would be caused, and to this end the litter and humus layer was disturbed as little as possible during felling.

The results to date indicate that in his locality a forest stand with an understorey of dense shrubs annually uses 17–22 in. of water in transpiration. Removal of this vegetation has been shown to increase streamflow by an amount equal to the estimated transpiration, if sprout growth is prevented. The largest increases to streamflow occur during the autumn replenishment period. Greatly increased flow is also caused by periods of heavy rain during the growing season. During the late winter and early spring, run-off is little affected. It is pointed out that the soil of the experimental area was developed under forest cover and has an exceptionally high infiltration capacity and a structure favourable to water storage. Without the protection of vegetation and the annual addition of organic material, such a soil structure will ultimately break down and the soil become less favourable for infiltration and storage.

[60]. 11.62.3 (73) : 91.3 : 12.11.14. DUNFORD, E. G., and FLETCHER, P. W. **Effect of removal of stream-bank vegetation upon water yield.** *Trans. Amer. geophys. Union* 28 (1), 1947 (105–10). 7 refs. L.S.

Preliminary report on a project in which vegetation was cut along the streambanks of a 22-acre catchment area on the Coweeta Experimental Forest. Previous measurements [cf. previous abstract] have shown that complete removal of vegetation from a catchment area results in notable gains in water yield because of reduced transpiration. The cutting of riparian growth alone also resulted in a significant increase in yield of water. Preliminary examination of the streamflow data obtained immediately after cutting, showed virtual elimination of the diurnal fluctuation during the growing season. This indicates that the vegetation immediately adjacent to the stream is making appreciable demands upon groundwater supplies contributing directly to streamflow. It is concluded that important gains during the growing season in the southern Appalachian region may be realized with relatively little effort by eliminating the transpiration drain of riparian vegetation. This procedure can be of much practical value for municipal and industrial catchments during drought years, when even small increases in yield are of importance. *From authors' summary.*

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

See also *For. Abstr.* 10 (No. 145).

12.11.1. *Metabolism. Plant Constituents. Photosynthesis. Sap Flow. Translocation. Transpiration*

See also *For. Abstr.* 10 (Nos. 43–4, 48, 59–60, 67, 71, 154–5, 157, 311–2, 603–4, 666, 690).

[61]. 12.11.12 : 12.19.2–3 : 11.1 : 21.11. FULLER, H. J. **Carbon dioxide concentration of the atmosphere above Illinois forest and grassland.** *Amer. Midl. Nat.* 39 (1), 1948 (247–9). 1 ref.

Observations on the CO_2 concentrations at different levels of the atmosphere in forest and grassland. There was a steep gradient of CO_2 concentrations from soil surface to about 1 m. above soil surface. Concentrations at soil surface were significantly higher (as much as 0·181% compared with the usual 0·03–0·04%) in forest than in grassland, owing, no doubt, to the more sluggish air movement. The results suggest that at near-soil levels in forests with a low light intensity, CO_2 is present in such concentrations that not it but light intensity must be the limiting factor in photosynthesis.

[62]. 12.11.12. DECKER, J. P. **The effect of air supply on apparent photosynthesis.** *Plant Physiol.* 22 (4), 1947 (561–71). O.B.D.

The effect of air supply on the rate of photosynthesis of the entire shoot of a tree seedling enclosed in a chamber was studied, using seedlings of *Pinus taeda*, *Cornus florida* and *Liriodendron tulipifera*. The rate of photosynthesis varied hyperbolically with the rate of air supply and linearly with the mean CO_2 concentration over the range 0·52 to 0·45 mg/l. It is suggested that CO_2 pressure may be a significant factor in the altitudinal distribution of species.

[63]. 12.11.12 : 12.14.5 : 12.11.11. BURSTRÖM, H., and KROGH, A. **The biochemistry of the development of buds in trees and the bleeding sap.** *Biologiske Meddelelser,*

det Kgl. danske Videnskabernes Selskab, Copenhagen 20 (2), 1946. pp. 27. [E.e.] X.

[Cf. *For. Abstr.* 9 (No. 94).] During the period of development in March and April, samples were taken of buds from a small number of trees and shrubs and analysed for sugars, nitrogen and the ions K, Na, Ca, Mg, Mn and P. Samples were taken within the same period of bleeding sap from trunks and branches and likewise analysed. Sugars were present in all samples of sap, with a preponderance of hexose except in *Acer*. Organic nitrogen was regularly present in low concentration. Most of the ions were usually present in low concentration, but Na below the threshold in all cases. Quantitative results are given in the tables.

Even before any significant assimilation could take place the buds increased considerably in dry substance, nitrogen and most of the ions, but Na and Mn disappeared, when present initially.

Quantitative comparisons between the increases in carbohydrate, protein and ions, determined in the buds and the sap assumed to supply them, show that large quantities of sap are necessary, amounting to 2–10 ml. per g. for each fresh bud in a day, from which the growing cells take up the substances needed, while the water must be largely returned to the branches. This conception, which involves an active transferance of sugars and ions into the cells, is discussed. The total concentration of osmotically active substances in the water of the buds is very high at the end of winter and decreases more or less regularly during development. *Authors' summary.*

[64]. 12.11.12 : 31.22. **Interaction of water and porous materials.** *Nature, Lond.* 161 (4095), 1948 (629–31). HARTLEY, G. S. **The interaction of water and porous materials.** *Research* 1 (9), 1948 (407–11).

Reviews of the discussions which took place at the meetings at Southampton (March 31–April 2, 1948) initiated by the Colloid Committee of the Faraday Society. The 2nd and 3rd sessions were devoted to biological (particularly botanical) problems and discussion was largely concerned with the ascent of water in the trunk of a tall tree and the mechanism of the downward streaming of food-carrying water in other vessels of leaves and stems.

The adsorption of water in wood and charcoal was also discussed.

[65]. 12.11.14 : 11.11.4 : 12.14.5 : 12.11.22. OPPENHEIMER, H. R. **Studies on the water balance of unirrigated woody plants.** *Repr.* from *Palest. J. Bot. (R.Ser.)* 6 (1), 1947 (63–77). 19 refs.

The first part of the paper deals with cases of extreme restriction of plant transpiration after prolonged summer drought. Restriction to figures near zero have been reported in previous studies for *Pinus halepensis*, *Pinus nobilis*, *Ceratonia siliqua*, *Arbutus andrachne*, *Rosmarinus officinalis* and *Citrus sinensis*. The present report adds similar evidence for plants of *Quercus palaestina*, *Pistacia palaestina*, *Olea europaea* and *Cupressus sempervirens*. It is shown that certain sclerophyllous leaves represent highly effective structures for the prevention of both stomatal and cuticular water losses. The second part reports on a preliminary study of water use and water balance of unirrigated Plum and Apple trees, after 5 months' drought. Tests of stomatal aperture showed that the stomata play an important part in maintaining the water balance of the fruit trees studied but there are indications that this mechanism of regulation is inadequate to protect trees on stocks with shallow-rooting habits. The penetration of the roots into deeper or shallower soil layers and fissures in the rock seems, therefore, to be the main factor determining the water supply of the scion under dry conditions of soil and air. *From author's summary.*

12.11.2. *Reproduction. Propagation. Growth, Development*

See also *For. Abstr.* 10 (Nos. 201, 225–6).

[66]. 12.11.21 : 12.14.7. BRINK, R. A., and COOPER, D. C. **The endosperm in seed development.** *Bot. Rev.* 13 (8), 1947 (423–77).

[67]. 12.11.22 : 12.11.11 : 12.11.12. ROACH, W. A. **The rôle of mineral nutrition in the rootstock-scion effect. A progress report.** *Rep. E. Malling Res. Sta. 1946*, 1947 (88–94). 20 refs.

Past work on, and the present position of, the rôle of mineral nutrition in rootstock-scion effects are briefly reviewed. The chemical and physical methods of analysis employed are

given in two appendixes. Results of preliminary work prove that the rootstock exerts a considerable effect on the mineral composition of the scion worked on it. This effect is not merely quantitative; the relative proportions of a number of the elements are influenced to a considerable extent. *Author's summary.*

[68]. 12.11.22 : 12.11.15. THIMANN, K. V. and BEHNKE, J. **The use of auxins in the rooting of woody cuttings.** *Publ. Maria Moors Cabot Found.* No. 1, 1947. pp. 272. 274 refs. Price $1.00.

The authors have attempted to collect all published data of a quantitative, or semi-quantitative nature, and the present publication contains nearly 3 times as many references as the last summary of the subject, published in 1942 [see *For. Abstr.* 5 (91)]. The data are set out in tabular form, arranged in alphabetical order of species, and include literature reference, type of cutting used and age of material, month when taken, treatments of test specimens and controls, percentage of rooting and average number of roots per cutting for treated specimens and controls for indole-acetic, indole-butyric, and naphthalene-acetic acid, corresponding data for 'other auxins' (named individually), number of days between treatment and recording of results, additional notes and comments.

Wounding by scraping down to the cambium at the base of the cutting improves rooting markedly in many (but not all) species. The data on wounding are given in a special table.

[69]. 12.11.22 : 12.25 : 44.3 : 12.21 : 12.11.15. ROL, R. Recherches récentes en vue de la sélection de certaines essences forestières. **[Recent research on the selection of certain forest tree species.]** *Rev. Eaux For.* 87 (2), 1948 (84–8). [F.]

Mainly an account of American experiments in the vegetative propagation of rust-resistant clones of *Pinus strobus* by the use of growth substances.

[70]. 12.11.22 : 12.29 : 23.23.15. MCCLURE, F. A. **Gifts of science—Bamboo culms for industry.** *Foreign Agric.* 12 (2), 1948 (39). E.M.B.

Studies in Bamboo [sp. unspecified] are in progress at the Federal Agricultural Station at Mayaguëz, Puerto Rico, in order to improve the production of material for Bamboo furniture and split-Bamboo fishing rods. Promising results have been obtained from propagation by means of leafless branch cuttings. The yield of young plants is greatly increased by this process, the height of plants when ready for distribution is only a fraction of that of the usual massive off-sets, and the work of preparation is materially reduced. In seed storage investigations, storage over $CaCl_2$ at room temperature proved most satisfactory.

[71]. 12.11.23 : 12.14.2 : 12.26–8 : 12.11.11. JACQUIOT, C. Effet inhibiteur des tannins sur le développement des cultures *in vitro* du cambium de certains arbres forestiers. **[Inhibitory effect of tannins on cultures *in vitro* of the cambium of certain forest trees.]** *C.R. Acad. Sci., Paris* 225 (10), 1947 (431–6). [F.] D.S.I.R.

Cultures of the cambium of certain species (*Quercus* spp. and *Castanea* spp.) rich in tannins, showed little or no development. It proved possible to remove this inhibitory affect either by lowering the tannin content or by insolubilizing the tannins.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance. Cytology*

See also *For. Abstr.* 10 (Nos. 151–2, 195, 198, 223).

[72]. 12.11.3. POOLE, A. L. **Some observations upon forest tree breeding.** *N.Z. J. For.* 5 (4), 1947 (269–77). 6 refs.

Observations on experiments in forest tree breeding current in Sweden, Denmark, Germany, Canada and the U.S.A., with a discussion on the application of such methods to New Zealand requirements.

[73]. 12.11.3 (485). JOHNSSON, H. **Forest tree breeding in Sweden.** Pulp Paper Res. Inst. Can. 1947. Pp. 5. [Föreningen för Växtförädling av Skogsträd, Ekebo, Källstorp, Sweden.]

[74]. 12.11.3 : 12.11.22 : 23.26. LARSEN, C. S. Genotypens Bedømmelse hos Skovtræer. **[Estimation of the genotype in forest trees.]** *Svenska SkogsvFören. Tidskr.* 45 (6), 1947 (333–63). 8 refs. [Dan.e.]

A condensed version in Danish of the paper in *Aarsskr. Vet.-Landbohøjsk.* 1947 (87–128)—cf. *For. Abstr.* 9 (No. 2081).

[75]. 12.11.3 : 12.25 (485). ANDERSSON, E. **Pollen and seed-setting studies of an asyndetic Spruce and some normal Spruces; and a progeny test of Spruces.** *Medd. Fören. Växtförädl. Skogsträd* No. 45, 1947. pp. 22. 26 refs. [E.e.] *Repr.* from *Svensk PappTidn.* 50 (4–7), 1947. [Brunsberg Branch Station, Swedish Forest Tree Breeding Association, and Institute of Genetics, University of Lund.]

Reports on (1) studies of (morphological) pollen fertility, size of stomata and male flowers, and seed setting after open pollination, selfing and cross-pollination, in an asynaptic Spruce (*Picea abies*) [see *For. Abstr.* 9 (No. 113)], three trees with sticky chromosomes and some others with normal meiosis; and (2) a progeny trial of seedlings from open-pollinated parent trees.

(1) Wide variation was found to occur in pollen size, not only in pollen of the asynaptic tree and those with sticky chromosomes, but also in that of normal trees. The morphologically estimated pollen fertility of the asynaptic trees was 2·6%, the bulk of the good pollen consisting of giant grains. The morphological pollen fertility of the trees with sticky chromosomes was low (about 40–60%). The asynaptic tree had smaller stomata and larger male flowers than had normal trees, and showed significant differences in stoma size in different parts of the crown.

Seed setting was poor after artificial selfing, the percentage of full seed and the germination % being much lower than after artificial cross-pollination, which in turn gave poorer setting than open pollination. Different crossings gave varying results in respect of the number of full and germinable seeds.

(2) Results of progeny trials of seedlings from open-pollinated trees are tabulated in detail. Three- and 4-year-old progenies already display significant differences in height and diameter growth, as well as in the number of branches per whorl.

[76]. 12.11.3 : 12.25 : 42.21 : 21.8. [DAY, W. R.] **[Frost injury and provenance of European Larch.]** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (10).

The relative susceptibility to frost injury of different provenances of *Larix decidua* was the subject of further study [cf. *For. Abstr.* 8 (No. 2073)]. Experiments have shown that there are markedly significant differences in frost susceptibility between different provenances as tested in a refrigerator. They also suggest that, if the elevation of the provenances is the same, susceptibility decreases as the latitutde becomes more northerly; and if elevation and latitude are the same, susceptibility is highly correlated with date of flushing. The material was not adequate to test the variation in susceptibility with change of elevation, but it is believed that there is a direct correlation. It has been suggested that susceptibility to irreversible plasmolysis is directly correlated with susceptibility to frost injury, and in the two cases tested this proved to be so.

[77]. 12.11.3 : 12.26–8 : 12.14.5 : 12.12. SAARNIJOKI, S. Die Schlitzblättrigkeit der Erlen und Birken im Lichte von Rückschlägen und einigen Kreuzungen. **[The cut-leaved condition in Alders and Birches in the light of phenomena of reversion and some crossings.]** *Commun. Inst. for. Fenn.* 34 (2), 1946 (1–68). 49 refs. [G.fi.]

Describes artificial crossings made with cut-leaved forms of *Alnus incana*, *Betula verrucosa* and *B. pubescens*, including back-crosses with the normal-leaved types and crosses in which the pollen was obtained from individual branches on cut-leaved trees that showed reversion towards the normal condition. The anatomical and morphological basis of the cut-leaved condition is discussed with particular reference to associated phenomena of reduction in other organs. Pending the eventual production and study of an F_2 generation, results in the F_1 are tentatively analysed.

The evidence obtained suggests that in the forms studied the cut-leaved state is governed by a single pair of genes, and is only one of the symptoms of a general reduction process which may be detected in a narrowing of other parts of the plants. It is probable that 'cut-leavedness' represents a gene mutation recessive to the normal condition.

[78]. 12.11.3 : 12.26–8 (485). JOHNSSON, H. Tio års aspförädling vid Föreningen för växtförädling av skogsträd. **[Ten years' Aspen breeding by the Swedish Forest Tree Breeding Association.]** *Medd. Fören. Växtförädl. Skogsträd* No. 46, 1947. pp. 9. [Sw.] *Repr.* from *Svensk PappTidn.* 50 (17–20), 1947.

A lecture reviewing progress made since the beginning of breeding work in 1937, with brief

notes on hybridization (for producing polyploids, superior strains within the normal diploid species and interspecific crosses), colchicine-induced polyploidy, photoperiodism, and propagation technique.

Altogether 704 crossings have been made, from which 148,000 plants have been raised. Some of the crosses have already shown such promise that stocks have been distributed (43,000 plants in the past 4 years) for trial on forest estates. In growth trials run directly by the Association, the outstanding result so far has been the greatly superior vigour of *P. tremula* × *P. tremuloides* in comparison with the native *P. tremula*. In 6 years this hybrid has reached 420 cm. in height, has a stem volume representing 15 cu.m./ha., and a current annual increment for the last year of 4 cu.m./ha., the corresponding figures for *P. tremula* being 207–333 cm., 2·3–4·9 cu.m./ha., and 0·69–0·73 cu.m./ha. The hybrid is not attacked by *Fusicladium radiosum* and only to a small degree by rust. As regards quality, however, some crosses of *P. tremula* élite trees are superior to the interspecific hybrids so far produced. Triploid 'giant Aspens' (*P. tremula*) have been under extensive trial for 3 years only. During their first season they grew no faster than diploid controls, but in the second and third their volume increment has been superior by about 30%.

Parents for future crosses must be sought not only in Sweden, but also from other parts of the natural range of *P. tremula*. The same applies to *P. tremuloides*, of which only a single tree, and that of unknown origin, has so far been available for hybridization experiments.

[79]. 12.11.3 : 12.26–8. Stockar, A. Complemento cromosomico diploide de algunas especies de '*Aleurites*'. [**Diploid chromosome number of some species of *Aleurites*.**] *Rev. argent. Agron.* 13, 1946 (253–5). [Span.] *Biol. Abstr.* 21 (7), 1947 (16291).

Aleurites fordii. *A. montana*, *A. cordata*, and *A. trisperma* are reported with a diploid chromosome number of 22. *A. moluccana* is a tetraploid with 44 chromosomes.

12.12. Teratology

[80]. 12.12. Cormio, R. Il caso della fitosinfisi dei platani di Santa Margherita Ligure. [**The fusion of Plane trees at Sta. Margherita Ligure.**] *Repr.* from *Risveglio agricolo* 7/8, 1947. pp. 5. [It.] P.R.

Account, with illustrations, of examples of branch and stem fusions of various species of trees.

[81]. 12.12. : 12.26–8 : 13.2 : 45.3. Jensen, P. B. **Formation of galls by *Mikiola fagi*.** *Physiol. Plant., Copenhagen* 1 (1), 1948 (95–108). 2 refs. [E.e.]

Describes experiments to discover whether the larvae of *Mikiola fagi* secrete substances which cause gall formation. The larvae were placed either directly on young leaves, enclosed in a glass tube, or on a paste (0·5 g. lanolin, 0·5 g. wort and 0·5 g. talc) on the leaf; paste on which larvae had been lying was placed on other leaves. In all cases the leaf was affected, presumably by larval secretions, showing either cell division or cell elongation. It is concluded that the larva secretes substances similar to growth substances in definite places on the Beech leaf and in the gall, causing the latter to adopt its definite form.

12.14. Organography. Morphology. Anatomy. Histology

See also *For. Abstr.* 10
(Nos. 65–6, 77, 114, 119, 127, 691).

[82]. 12.14 : 02.1. Eames, A. J., and MacDaniels, L. H. **An introduction to plant anatomy.** McGraw-Hill Book Co., Inc., New York. 1947. pp. xviii + 427. Numerous refs. Price 27*s*.

12.19. Geographical Distribution. Plant Geography and Sociology

See also *For. Abstr.* 10
(Nos. 116, 137, 145, 690).

12.19.1. *Regional Floras, including Check Lists*

[83]. 12.19.1 (54 : 588) : 02.41. Rao, Y. R. **A list of some of the more common plants of the desert areas of Sind, Baluchistan, Rajputana, Kathiawar and south-west Punjab with their various local names as far as available.** *Misc. Bull. imp. Coun. agric. Res. India* No. 43, 1941. pp. ii + 45 + plates.

[84]. 12.19.1 (569). **List of trees and shrubs native to Palestine.** *App. II* to *Rep. Palest. Dep. For.* 1947. pp. 4.
Cf. *For. Abstr.* 10 (No. 126).

[85]. 12.19.1 (569) : 21.0 : 23.27. **List of exotic ornamental and forest trees and shrubs in Palestine.** *App. III* to *Rep. Palest. Dep. For.* 1947. pp. 6.
Cf. *For. Abstr.* 10 (No. 149).

[86]. 12.19.1 (675). MICHELSON, A. Liste des essences forestières du domaine identifiées au 30 juin 1944. **[List of forest species of the district [of Kivu] identified June 30th, 1944.]** Comité national du Kivu. [1944?] pp. viii + 212. [F.]

[87]. 12.19.1 (681). MILLER, O. B. **Bechuanaland Protectorate (provisional list).** *Check List imp. For. Inst., Oxf.* No. 6, 1948. pp. 77 + 12 photos.

[88]. 12.19.1 (71) : 01.6. SENN, H. A. **A bibliography of Canadian plant geography. VIII. The period 1936–1940.** *Transactions, Royal Canadian Institute* 26 (2), 1947 (153–344). D.S.I.R.

[89]. 12.19.1 (81). FRAGA, M. V. G. Ensaio de índice da flora dendrológica do Brasil. **[A tentative classified list of Brazilian tree species.]** *Arq. Serv. flor., Brasil* 2 (2), 1946 (67–156). 29 refs. [Port.]

[90]. 12.19.1 (967) : 09.7. GLASSMAN, S. F. **A survey of the plants of Guam [including forest plants].** *J. Arnold Arbor.* 29 (2), 1948 (169–85 + 2 maps). 14 refs.

12.19.2-3. *Vegetation Types*

[91]. 12.19.2–3 (481) : 11.49.5 : 09.2. LÅG, J. **Investigations of a peatland, part of which has been subjected to natural draining.** *Medd. norske Skogforsøksv.* 9 (4) (No. 34), 1947 (459–80). 27 refs. [E.nor.]

Discusses the probable history and the present vegetation of the Frebergsmyra, Vestfold, with special reference to a portion which has been naturally drained by subterranean watercourses developing probably in the thin mineral soil between the peat and the surface of the bedrock. This portion bears Norway Spruce/Birch (*B. pubescens*) forest with *Vaccinium myrtillus* dominant and *Rubus chamaemorus* a characteristic species in the ground flora.

[92]. 12.19.2–3 (51) : 09.7. TENG, S. C. **Forest geography of the East-Tibetan plateau.** *Bot. Bull. Acad. Sinica* 2 (1), 1948 (62–7 + map). 4 refs.

A description of the forest flora of the East Tibetan plateau, the most heavily wooded region of China apart from Manchuria. North of the Kuenlun tundra lies the boreal forest, characterized by a limited number of tree species of small size and slow growth. *Picea asperata* is the single climax dominant in this region. Junipers occur as preclimax dominants. The forest is broken in nature, the principal growth being confined to northerly aspects. South and east of the Kuenlun tundra lies an extensive forest region of the subalpine type. Species of Spruce and Fir dominate here, with *Rhododendron* and *Arundinaria* common as undergrowth. This forest can be classified into 4 distinct sub-regions according to the species constituting the climax dominants, as follows:—

(1) Northeastern subalpine forest—*Abies faxoniana/Picea purpurea* association.

(2) Northern subalpine forest—*Abies squamata/Picea balfouriana* association.

(3) Southern subalpine forest—*Abies georgei/Picea likiangensis* association.

(4) Southeastern subalpine forest—*Abies faberi/Picea brachytyla* association.

[93]. 12.19.2–3 (663) : 11.1 : 11.2 : 11.4. TROCHAIN, J. Contribution à l'étude de la végétation du Sénégal. **[Contribution to the study of the vegetation of Senegal.]** Librairie Larose, 11 Rue Victor-Cousin, Paris. 1940. pp. 428 + 342 photos. 363 refs. [F.f.]

[94]. 12.19.2–3 (663) : 11.49.6 : 12.19.4. AUBRÉVILLE, A. La Casamance: phytogéographie forestière; latérisation. **[Casamance: forest phytogeography and laterization.]** *Agron. trop.* 3 (1/2), 1948 (25–52). [F.]

Account of the forest ecology and the process of laterization in that part of Senegal which forms a corridor between Gambia and Portuguese Guinea. Brief descriptions are given of non-forest vegetation types, and the following types are analysed in detail: open, dry forest with Bamboo understorey; *Daniella* forest; dense semi-dry forest with *Parinari excelsa*, *Erythrophleum guineense*, and *Detarium senegalense*. The origin of these types is discussed with particular reference to the rôles of fire and of shifting cultivation. Finally

the nature and progress of laterization in this region are described.

[95]. 12.19.2–3 (671) : 09.7 : 11.2. PORTÈRES, R. Climat et végétation sur la chaîne des Bambuttos (Cameroun). **[Climate and vegetation on the Bambutto chain (Cameroons).]** *Bull. Soc. bot. France* 93 (9), 1946 (352–60). [F.] O.B.D.

[96]. 12.19.2–3 (689) : 04.4 : 97.1 : 11.48 : 11.49. TRAPNELL, C. G., MARTIN, J. D., ALLAN, W., *et al.* **Vegetation-soil map of Northern Rhodesia, with an explanatory memoir.** Govt. Printer, Lusaka. 1947. pp. 20 — maps. Price 5*s*.

The map, which is on a scale of 1 : 1,000,000, represents vegetation types and soil types by a mixture of colours, letters and numbers. The accompanying memoir explains the system of symbols, the sources, soil classification (Red Earths, Lake Basin soils or Grey Earth, Plateau soils, Kalahari sands, Upper Valley soils, Lower Valley soils, Grey and Black Swamp soils, Escarpment Hill soils), and vegetation classification (Evergreen and Semi-deciduous types; *Brachystegia*/*Isoberlinia* woodlands; Other Deciduous woodlands and forests; Deciduous-thicket type; High grass/woodland or 'Chipya' types; Bush-group, Tree/grassland, and Scrub/grassland types; Grassland types).

The application of the classification to land usage is explained and an index given of land resources (useless land, partial cultivation land, shifting cultivation land, re-cultivation land, semi-permanent or permanent land, land of present forestry importance, land of present or potential pastoral importance) as related to soil and vegetation types.

[97]. 12.19.2–3 (729.7) : 34 : 33.4. STEHLÉ, H. Les reliques végétales de la Réserve Caraïbe de la Dominique (Antilles anglaises). **[The relict vegetation of Dominica (Lesser Antilles).]** *Bull. Soc. bot. France* 94 (5/6), 1947 (158–66). [F.] O.B.D.

[98]. 12.19.2–3 (795) : 11.49 : 56. WILDE, S. A., WHITFORD, P. B., and YOUNGBERG, C. T. **Relation of soils and forest growth in the driftless area of south-western Wisconsin.** *Ecology* 29 (2), 1948 (173–80). 10 refs.

[99]. 12.19.2–3 (931) : 61.3. HOLLOWAY, J. T. **Principles of primary forest ecological survey: their application to the forests of Otago and Southland.** *N.Z. J. For.* 5 (4), 1947 (285–94).

Outlines the general principles on which a forest ecological survey should be based. Extensive study, or primary survey, must always precede local, intensive studies. Where this is not possible, the limitations of the local studies and their inter-relationship with general problems must be recognized. A study of the distribution of the Otago and Southland forests illustrates this view. Three main formations are recognized:

(1) Podocarp/hardwood forests of coastal regions with temperate oceanic climates.

(2) *Nothofagus* forests of inland regions with subcontinental climates.

(3) *Nothofagus* forests of regions with mountain climates.

The specific differences and silvicultural characteristics of the two *Nothofagus* formations are analysed. *From author's summary.*

[100]. 12.19.2–3 (98 : 71). MARR, J. W. **Ecology of the forest-tundra ecotone on the east coast of Hudson Bay.** *Ecol. Monogr.* 18 (1), 1948 (117–44). 5 refs.

The ecotone or transition zone between forest and tundra between latitudes 53 and 56° N. was observed from the air, intensive studies were made on the ground, and detailed analyses of tree growth-rings were made. Field observations showed that trees grow on all areas of suitable soil regardless of exposure to climatic factors. Areas unsuitable for trees because of absence of soil, are occupied by tundra. Trees are invading tundra areas as soil develops. Analysis of growth rings showed that tree growth on good soils has not been critically limited in the past 250 years. It is concluded that this portion of the ecotone has a forest climate, that occurrence of trees is limited by dearth of soil, and that the potential climatic limit of forest under existing climatic conditions is an unknown distance north of the present actual limit.

12.19.2. *Forest Types*

See also *For. Abstr.* 10 (Nos. 50, 173, 820).

[101]. 12.19.2 (494) : 12.26–8 : 22.83 : 21 : 23.1. TREPP, W. Der Lindenmischwald

(*Tilieto-Asperuletum taurinae*) des schweizerischen Föhn- und Seebezirkes, seine pflanzensoziologische und forstliche Bedeutung. [**The mixed Lime forest of the föhn and lake region in the Swiss Préalpes, its significance in plant sociology and forestry.**] *Beiträge zur geobotanischen Landesaufnahme der Schweiz* No. 27, 1947. pp. 128 + 1 tbl. 38 refs. [G.g.] Also summarized in *Schweiz. Z. Forstw.* 98 (12), 1947 (451–60). [G.f.]

Deals with the ecology of the *Tilieto-Asperuletum taurinae*, a relict community which attained its greatest distribution in the warm post-glacial period but has perpetuated itself only in climatically favoured positions, on calcareous sedimentary formations bearing immature soils of the brown-earth, rendzina and humus-carbonate groups, the high Ca content of which is maintained by material falling and water seeping down from higher slopes. Floristics, synecology, successional relationships and locality factors are considered in detail, and a short final section discusses the significance of the community in forestry. The Limes (*Tilia cordata* and *T. platyphyllos*) are used in the match and plywood industries. Valuable timber can only be produced in, and much coppice has therefore been converted to, high forest. Natural regeneration in high forest presents some difficulties. The essential conditions are: (1) A moist, permeable soil, rich in nutrients, with good aeration and drainage, but protected from drying out. The decomposed litter of Lime and its associates, e.g. Ash, Maples and Hazel, forms an ideal seedbed. (2) Protection from direct insolation, by light shrub and herbaceous cover, during germination and the early seedling stage. (3) Access to more light soon afterwards, and protection from serious competitiors, e.g. Beech (the climax species).

[102]. 12.19.2 (543) : 12.29 : 22.83.2 : 34.28. CHAKRAVARTI, R. **The Bamboo forests of Raigarh state.** *Indian For.* 73 (11), 1947 (490–5).

Describes the mixed forests with a preponderance of *Dendrocalamus strictus* in Raigarh State in the Eastern States Agency, and discusses problems connected with their management. The quality of the Bamboo is rather poor, the area exploited annually is about 35,000 acres, and the estimated yield 20–25,000 tons air-dry Bamboos. The felling cycle is 4 years and the system of working, monopoly-cum-royalty. The bulk of the Bamboo is used in paper mills. Chief enemies are fire and grazing (domestic). *From author's summary.*

[103]. 12.19.2 (748) : 22.83.2 : 12.25. BURNHAM, C. F., FERREE, M. J., and CUNNINGHAM, F. E. **The White Pine—Hemlock forests of the Anthracite region.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 11, 1947. pp. 25. 16 refs.

12.19.4. *Succession*

See also *For. Abstr.* 10 (Nos. 51, 94, 111).

[104]. 12.19.4 (4) : 09.2. ENGEL, A. Mécanisme et historique des migrations forestières de l'époque tertiaire à nos jours. [**Mechanism and history of forest migrations from the Tertiary Epoch to the present day.**] *Mémoires de la Société vaudoise des Sciences naturelles* 7 (3), 1943 (167–218). [F.] Also in *Bull. Soc. for. Franche-Comté* 24 (5; 6) 1943 (196–203; 223–28).

In the author's view, birds, particularly crows, thrushes and pigeons, were the most important instruments of forest migration in Europe in the last glacial and post-glacial periods. The factors most effective in enabling a forest species to escape from the advancing ice were (1) that its fruit should be attractive to such birds, (2) that it should bear seed at a relatively early age, say about 50 years. Genera such as *Sequoia*, *Liriodendron*, *Magnolia*, *Cupressus*, which have disappeared, or almost disappeared, from the European flora, are distinguished by their longevity (with correspondingly late maturity) and very small seeds. The southward flight of Beech away from glacial conditions was apparently more rapid than its return, because the wood pigeon, its main vehicle, migrates southward in the autumn when there is plenty of mast, and northward in the spring when it is scarce. Notes are given on relict formations of various species, probably dating from the last glaciation.

[105]. 12.19.4 (45) : 09.2. CRESCIOLI, S. La storia forestale dell'Italia nel postglaciale. [**Forest history of Italy in the postglacial period.**] *Ital. for. mont.* 3 (2), 1948 (92–7). 9 refs. [It.]

[106]. 12.19.4 (795–7) : 09.2. HANSEN, H. P. **Postglacial forest succession, climate, and chronology in the Pacific Northwest.** *Transactions, American Philosophical Society* 37 (1), 1947. pp. 130. 209 refs. L.S.

[107]. 12.19.4 (795) : 09.2. HANSEN, H. P. **Postglacial forests of the Glacier National Park region.** *Ecology* 29 (2), 1948 (146–52). 14 refs.

The postglacial succession of tree species in Oregon is deduced from analyses of two sphagnum bogs. The predominance of Lodgepole Pine in more recent times is indicative of a period of extensive fires which favoured its expansion. Western Larch, which is very susceptible to fire, has now largely replaced it.

12.2 *Special (Systematic) Botany*

[108]. 12.2 : 09.1. JESSEN, K. F. W. Botanik der Gegenwart und Vorzeit in culturhistorischer Entwicklung. Ein Beitrag zur Geschichte der abendländischen Völker. **[Botany past and present—its part in cultural and historical development. A contribution to the history of the Western nations.]** Chronica Botanica Co., Waltham, Mass. Wm. Dawson & Sons, London, W.C.2. Re-publ. 1948. xxii + 495. [G.] Price $6.00.

This re-publication of Jessen's classic, originally published in 1864, heads a new series entitled 'Pallas' (ed. Frans Verdoorn), which will consist of reprint editions of out-of-print and classic scientific works.

12.21. Fungi

[109]. 12.21. GOIDÀNICH, G., and RUGGIERI, G. Un reperto di sistematica micologica di eccezionale interesse fitopatologico. **[A discovery in mycological systematics of exceptional phytopathological interest.]** *Repr.* from *Ricerca scientifica e Ricostruzione* 17 (7/8), 1947. pp. 7. 9 refs. [It.] P.R.

The authors claim to have found a close relationship, if not actual identity, between *Dothiorella ulmi*, causing die-back of Elm, and *Deuterophoma tracheiphila*, the causative agent of 'mal secco' of *Citrus* spp. They propose that the former should be temporarily known as *Deuterophoma ulmi*. [Cf. *For. Abstr.* 10 (Nos. 705–8).]

[110]. 12.21 : 07.2. HEIM, R. Sur les caractères des Polypores en culture artificielle. **[Characteristics of the Polyporaceae in culture.]** *C.R. Acad. Sci., Paris* 225 (10), 1947 (421–3). [Fr.] P.R.

[111]. 12.21 (798) : 12.19.4 : 44.3. BAXTER, D. V. **Occurrence of fungi in the major forest types of Alaska.** *Papers of the Michigan Academy of Science, Arts and Letters 1945* 31, 1947 (93–115 + 29 photos). L.S.

A study of forest successions and fungus populations in five different types of forest in Alaska.

12.25-9. Spermatophyta

[112]. 12.25–9 (410). MAKINS, F. K. **The identification of trees and shrubs: how to name any wild or garden tree or shrub likely to be met with in the British Isles,** with 2,500 diagrams made by the author. J. M. Dent & Sons Ltd., London. 2nd ed., 1948. pp. v + 375. 46 refs. Price 21*s.*

[113]. 12.25–9 (71) : 12.19.1. GALBRAITH, A. W., and RICHARDSON, A. H. **Trees we should know.** Alexander W. Galbraith, Ltd., Toronto, Canada. 1946. pp. xi + 240. 235 original photographic studies by A. W. Galbraith, with brief descriptions by A. H. Richardson. Price 12*s.* 6*d.*

[114]. 12.25–9 : 12.13 : 12.14. MAGINI, E. Il riconoscimento delle piantine allo stato giovanile. **[The identification of seedlings in an early stage of development.]** *Ital. for. mont.* 3 (2), 1948 (118–20). [It.]

12.25. Gymnosperms

[115]. 12.25 (51). MERRILL, E. D. ***Metasequoia*, another 'living fossil'.** *Arnoldia* 8 (1), 1948 (1–8). E.B.

Seeds of *Metasequoia glyptostroboides*, the supposedly extinct Mesozoic tree recently discovered in China [cf. *For. Abstr.* 8 (p. 596)] have now been collected for the Arnold Arboretum and distributed to institutions in America and Europe. The seeds have a high degree of viability and seedlings are now being raised. The expedition sent to China to collect the seeds located only about 1,000 trees, including 100 large ones, scattered over an area of about

800 sq. km. in Szechuan province at altitudes of 900–1,300 m. They occur on slopes, along small streams, and near paddy fields (some of them planted there). This is a region of considerable rainfall with some ice and snow in the winter months. The largest tree measured was 35 m. high and its trunk 2·3 m. in diameter. The leaves are deciduous, and the trees are leafless in the winter months. In general appearance the leafy branchlets resemble those of the genus *Glyptostrobus*.

[116]. 12.25 : 01.2 : 12.19 : 31.0. CEBALLOS, L. Pinos. (Síntesis botánica del género *Pinus*). [**Pines. (A botanical conspectus of the genus *Pinus*).**] *Montes, Madrid* 3 (18), 1947 (529–40 + map). [Span.]

A summary of the taxonomy of the genus *Pinus* with a list of species, their habitats and vernacular names, a list of synonyms, a classification of species according to uses and a map showing geographical distribution.

[117]. 12.25. GRAY, N. E., and BUCHHOLZ, J. T. **A taxonomic revision of *Podocarpus*. III. The American species of *Podocarpus*: Section *Polypodiopsis*.** *J. Arnold Arbor.* 29 (2), 1948 (117–22 + 5 photos). 10 refs.

[118]. 12.25. BUCHHOLZ, J. T., and GRAY, N. E. **A taxonomic revision of *Podocarpus*. IV. The American species of section *Eupodocarpus*, Sub-sections C and D.** *J. Arnold Arbor.* 29 (2), 1948 (123–51 + 21 photos).

12.26-8. Dicotyledons

[119]. 12.26–8 : 12.14 : 21 : 31.2 : 31.1. KUJALA, V. Koivututkimuksia. [**Some recent research data on Birches.**] *Commun. Inst. for. Fenn.* 34 (1), 1946 (1–36). 22 refs. [Fi.e.]

It appears practicable to distinguish the rather uniform *B. verrucosa* from the polymorphic *B. pubescens*, leaf shape being a particularly good character. Evidence from cytology and breeding experiments [cf. *For. Abstr.* 8 (No. 2296); 9 (Nos. 116, 766)] has shown that hybrids between the two are less common than had been supposed on morphological grounds. Compared with *B. pubescens*, *B. verrucosa* grows faster and taller, has a straighter stem and coarser branches, is more light-demanding and prefers drier ground, flushes about a week earlier, and includes the forms producing figured wood. [Cf. *For. Abstr.* 9 (Nos. 1498–9).]

Kujala's investigations have revealed that the individual cells of *B. pubescens* are larger than those of *B. verrucosa*; the data presented in evidence refer to pollen diameter, stomatal guard cells, and fibres, tracheids and vessels of the wood. Size of guard cells was always correlated with leaf shape, though not with that of catkin scales or fruit. Several forms usually regarded as intermediates were not so in the size of their guard cells. Wood of *B. pubescens* also had a higher percentage of vessels, a higher moisture content and a lower specific gravity than that of *B. verrucosa*, and was weaker in both bending and compression tests, though more elastic and tougher. [Cf. *For. Abstr.* 8 (No. 1801).]

These results, which are shown in tables and graphs, indicate that it is desirable to distinguish the two species in practice. Characteristic leaf shapes are illustrated.

[120]. 12.26–8 (8) : 31.0. BURKART, A. Leguminosas nuevas o críticas, II. [**New or critical Leguminosae.**] *Darwiniana, B. Aires* 7 (4), 1947 (504–40 + plate). [Span.] O.B.D.

Six new South American species of *Mimosa*, a new species of *Acacia* and a new species of *Pithecellobium* are described. *A. albicorticata* is found in the extreme northwest of Argentina, in Paraguay (probably) and Bolivia. It is noteworthy as being a quick-growing and easily transplanted species. A study of its wood structure is included.

[121]. 12.26–8 (881). SANDWITH, N. Y. **Two new leguminous trees of British Guiana.** *Contributions, Gray Herbarium, Harvard University, Cambridge, Mass.* No. 165, 1947 (25–9). *Abstr.* in *Trop. Woods* No. 93, 1948 (60).

Sweetia praeclara Sandwith sp. nov. (Blackheart) and *Swartzia bannia* Sandwith sp. nov. (Bannia).

[122]. 12.26–8 (81). KUHLMANN, J. G. O gênero Eucalyptus no Brasil. [**Eucalyptus in Brazil [with a key to the genus].**] *Arq. Serv. flor., Brasil* 2 (2), 1946 (1–37 + 26 plates). 5 refs. [Port.]

[123]. 12.26–8 (81). MAGUIRE, B. **A new *Licania* [*L. duckei* Maguire sp. nov.] from**

the Amazon basin. *Trop. Woods* No. 93, 1948 (29–30 + 1 photo).

[124]. 12.26–8 (666.8) : 34.25. KERHARO, J., and BOUQUET, A. Les *Morindas* de la Côte d'Ivoire et leurs utilisations thérapeutiques. **[The *Morinda* species of the Ivory Coast and their therapeutic uses.]** *Rev. int. Bot. appl. Agric. trop.* 27 (399/400), 1947 (418–20). [F.] P.R.

[125]. 12.26–8 (51). P'EI, C. **Notes on Tamaricaceae of China.** *Bot. Bull. Acad. Sinica* 2 (1), 1948 (18–22).

[126]. 12.26–8 (569). GUTMANN, H. **The genus *Tamarix* in Palestine. To the knowledge of Palestinian forest trees.** *Palest. J. Bot.* (*J. Ser.*) 4 (1), 1947 (46–54 + plate). 17 refs.

[127]. 12.26–8 : 12.14. MELVILLE, R. **Typification and variation in the smooth-leaved Elm, *Ulmus carpinifolia* Gleditsch.** *J. Linn. Soc.* (*Bot.*) 53 (349), 1946 (83–90 + 1 photo). L.S.

12.29. Monocotyledons

[128]. 12.29 (696). DUROCHER YVON, F. **Seychelles botanical treasure: 'The Coco-de-mer' Palm (*Lodoicea maldivica*, Pers.).** *Repr.* from *Revue agricole de l'Île Maurice* 26 (2), 1947 (69–87 + 2 maps). 8 refs. [E.]

13. FOREST ZOOLOGY

13.1. *General Zoology*

See also *For. Abstr.* 10 (Nos. 722, 725, 832, 834).

[129]. 13.11 : 13.2 : 31.43. SCHMIDT, H. Beiträge zur Kenntnis der Darmsymbionten der holzfressenden Termiten. **[Contribution to the study of intestinal symbionts of wood-eating termites.]** *Mitt. Reichsinst. Forst- u. Holzw., Hamburg* No. 2, 1947. pp. 7. 40 refs. [G.e.f.span.]

Cf. *For. Abstr.* 10 (Nos. 492–4).

[130]. 13.15 : 13.2 : 22.1. MACKENZIE, J. M. D. **Birds and silvicultural systems.** *Quart. J. For.* 42 (2), 1948 (89–92). 3 refs.

The reason for the markedly greater number of birds to be found in selection forest may be the high proportion of edge to area. Forest managed under some form of group system, where patches of regeneration are progressively freed and enlarged, comes next in order of favourability for bird life; then the strip system. Clear felling is the least desirable as it eliminates thickets for 5 or 6 years and reduces cover or edge. [Cf. *For. Abstr.* 8 (No. 980).]

[131]. 13.15 : 13.2 : 13.2 (439). GYŐRFI, J. Magyarország díszbogár- és cincérféléinek elosködő darazsai. **[Hymenopterous parasites of Buprestidae and Cerambycidae in Hungary.]** *Erdész. Kisérl.* 46, 1945–46 (167–212). 17 refs. [Hu.g.f.]

[132]. 13.15 : 13.2 : 12.21. SLABÝ, O. O ambrosiových plísních. **[On fungi associated with ambrosia beetles [: a review of literature].]** *Lesn. Práce* 26 (12), 1947 (375–83). 34 refs. [Cz.e.]

13.2. *Special (Systematic) Zoology*

[133]. 13.2 (44). THÉRY, A. Faune de France, 41: coléoptères buprestides. **[Fauna of France, 41: Buprestid beetles.]** Office Centrale de Faunistique, Fédération Française de Sciences Naturelles. 1942. pp. 221. 325 refs. [F.] P.R.

2. SILVICULTURE

See also *For. Abstr.* 10 (No. 820).

[134]. 2 : 12.25 (46) : 56 : 57. MARTIN BOLAÑOS, M. Ensayo de investigacion indirecta sobre origen, desarrollo y producciones de monte alto. **[Preliminary and general investigation on high forest origin, development and yield.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 18 (34), 1947. pp. 143. [Span.span.f.e.g.]

The author emphasizes the mistake of applying to Spanish conditions silvicultural practices which have been evolved in Central Europe. Thus, in Spain, no ready natural regeneration of Pines occurs. Comparative tables of growth of *Pinus sylvestris* in Spain and in Germany are offered to illustrate the divergences which can be exhibited by the same species in different

conditions. The particular problems of Spanish silviculture, climate, soil, fire hazard, competition with agriculture and grazing requirements, are discussed with some recommendations for Pine, the most important genus for Spain. The author believes in the formation of even-aged stands. Volume data are given for five species of Pine grown in Spain—chiefly artificial stands—with notes on the conditions under which they developed.

[135]. 2 : 12.26–8 (436). DRAPAL, O. Die Bedeutung der Pappel für den Wiederaufbau der österreichischen Forstwirtschaft. [**The importance of Poplars in the rehabilitation of Austrian forestry.**] *Allg. Forst- u. Holzw. Ztg.* 58 (5/6), 1947 (34–6). [G.]

The confusion of forms and nomenclature is emphasized, together with the need for selecting and certifying strains that will succeed in different local climates and on different sites. At a very conservative estimate, there are at least 7,440 ha. of forest land in the Austrian valleys which could yield 50,000 cu.m. annually from a felling area of 248 ha. [Cf. *For. Abstr.* 10 (Nos. 146, 216, 225–6).]

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

See also *For. Abstr.* 10 (Nos. 101, 119, 230, 634, 790, 845).

[136]. 21 : 12.25 : 31.0. GIORDANO, G. Monographie succincte du '*Juniperus procera*'. [**Short monograph on *Juniperus procera*.**] *Bois For. Trop.* 5 (1), 1948 (15–18). [F.]

[137]. 21 : 12.25 : 12.19. SEXTON, A. N. **Geographical distribution of *Pinus nigra*.** *N.Z. J. For.* 5 (4), 1947 (295–301 + plate). 5 refs.

A study of *Pinus nigra* is necessarily confused by the abnormal multiplicity of synonyms and varieties. To facilitate treatment the species may be split into 2 divisions. The first, the Southern Division, consists of the so-called Corsican type, the better timber tree. Its natural growth range is bounded by 38° and 42° N.; soils are of igneous origin and the selective influences of climate and man have played a major part in establishing tree types. The second, or Northern, Division is that of the Austrian variety, the protection-forest tree. Latitudinal limits are 42° and 48° N.; soils are mostly calcareous in origin. In this division climate has played the major part in establishing the tree type.

Both the Corsican and the Austrian variety have their place in a balanced forest economy, the former as a timber producer, the latter as a protector of forest soils and of future timber crops. *From author's summary.*

[138]. 21 : 12.25 (931) : 31.0 : 56.04. GRAYBURN, A. W. **The Umbrella Pine (*Sciadopitys verticillata*).** *N.Z. J. For.* 5 (4), 1947 (328–30). 4 refs.

A general account. An experimental plot on Mt. Koya in the Wakayama province of Honshu shows an annual volume increment (up to 1935) of 1·5%.

[139]. 21 : 12.26–8 (81) : 24.4 : 34.2. OLIVEIRA, A. O cajueiro. [**Cashew.**] *Bol. Sec. Agric. Ind. Com., Pernambuco* 14 (3), 1947 (271–3). [Port.]

Direct sowing of Cashew (*Anacardium occidentale*) is by far the most economical and successful method. Two or 3 seeds are sown in one hole and the two weakest seedlings removed after 2 months. Recommended spacing is 2 m. × 2 m. square, but where trees are being grown primarily for fruit the distance should be greater. Cashew is very quick growing, does not require much moisture, and is therefore eminently suitable as a shade tree for Coffee. It is being used for this purpose on an increasing scale in Brazil. If it is to be grown a year or more before the Coffee, interplanting with some annual crop such as tapioca, cotton or tomato is recommended. Cashew grows well in siliceous and silico-argillaceous soils. It is suitable for windbreaks and hedges and has been used for fixing sand dunes. [Cf. *For. Abstr.* 8 (p. 336).]

[140]. 21 : 12.26–8 : 44.3 : 45.3. WEISS, F., and ST. GEORGE, R. A. **Culture, diseases, and pests of the Box tree [*Buxus sempervirens*].** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1855, 1947. pp. 18.

[141]. 21 : 12.26–8 (469). GUERREIRO, M. G. Podemos aumentar a área dos soutos portugueses. [**We can increase the area of Chestnut stands in Portugal.**] *Agros* 30 (Spec. No.), 1947 (369–85 + 3 photos). 24 refs. [Port.]

Describes and illustrates by maps the distribution of Chestnut in Portugal with special reference to climate. The history of its cultivation and the silvicultural characteristics of the tree are discussed and the author gives an estimate of the amount of land and the location of areas that would be suitable for Chestnut cultivation in Portugal.

[142]. 21 : 12.26–8 (410) : 44.3. GLENN, E. M. **Growing Walnuts in England.** *Rep. E. Malling Res. Sta. 1946*, 1947 (160–4).

Descriptions are given of the propagation and cultivation of Walnuts in England, with notes on some suitable varieties, and on the more important diseases attacking the Walnut.

[143]. 21 : 12.26–8 : 31.0 (881). FANSHAWE, D. B. **Studies of the trees of British Guiana. III. Wallaba (*Eperua* spp.). IV. Purpleheart (*Peltogyne* spp.). V. Mora (*Mora excelsa* Bth.).** *Trop. Woods* No. 93, 1948 (1–28). 26 refs.

Cf. *For. Abstr.* 9 (No. 811). These studies deal with *Eperua falcata*, *E. grandiflora*, *Peltogyne pubescens*, *P. venosa* var. *densiflora*, and *Mora excelsa*.

[144]. 21 : 12.26–8 : 34.27. SPIELMAN, H. W. **Jaboticaba—'grape of Brazil' [*Myrciaria cauliflora*].** *Foreign Agric.* 12 (1), 1948 (18–19). 1 ref. E.M.B.

[145]. 21 : 12.26–8 : 12.11 : 12.19 : 45.1 : 09.2. HULDEN, E. Studien über *Fraxinus excelsior* L. **[Studies on *F. excelsior*.]** *Acta Botanica Fennica* No. 28, 1941. pp. 250. *c.* 450 refs. [G.g.] L.S.

An extensive study of the autecology of European Ash as described in literature and as revealed by the author's field investigations in Finland. Chapters are devoted to : (1) The natural range of the species. (2) Growth form and growth as affected by climatic and edaphic factors. (3) Reproductive factors. (4) Biotic factors (competition with other plants). (5) Influence of animals and man. Cultivation of Ash in Finland. (6) Fossil occurrences and migrations of the species. (7) Silvicultural conclusions.

[146]. 21 : 12.26–8 (437). Topole—stromy rýchle rastúce a dobrý úžitok davajúce. **[Poplars: rapid-growing trees that give good returns.]** *Pol'ana* 3 (3), 1947 (50–2). [Slovak.]

In a general commentary on a previous article, the writer recommends introducing more *Populus robusta*, which in his experience shows better growth and form than the earlier introduced *P. canadensis*. They should be grown in single trees or rows, or mixed with native species, and not in pure stands. [Cf. *For. Abstr.* 10 (Nos. 49, 135, 216, 225–6).]

21.0 *Adaptability to the General Environment. Acclimatization*

See also *For. Abstr.* 10 (Nos. 85, 158, 237).

[147]. 21.0 (492) : 12.25 : 57. HOEVE, J. TER Douglas, lariks en groveden in Nederland. **[Douglas Fir, Larch and Scots Pine in the Netherlands.]** *Tijdschrift der nederlandsche Heidemaatschappij* 58 (6), 1947 (184–7). [Du.] 4 gphs. H.S.B.

Considers the possibilities of replacing Scots Pine by Douglas Fir and Larch on better soils and gives graphs showing the comparative crop heights and volume yield of all 3, at different ages.

[148]. 21.0 : 12.25 (494). KUNZ, R. Einige Gesichtspunkte zum Lärchenanbau im Jura der Nordwestschweiz. **[Some points of view on the growing of Larch in the Jura of N.W. Switzerland.]** *Schweiz. Z. Forstw.* 99 (1), 1948 (49–55). [G.f.]

An extract from a thesis, the object of which was to investigate within a restricted region—the Jura of Basle and the neighbouring country—any relations between the growth of Larch [*Larix decidua*] and certain site factors. The provisional conclusions are as follows:—

(1) Climate plays no decisive part within the region. Physical soil characteristics are more important than chemical differences due to differences in the parent materials. The best-quality Larch is found on permeable, well aerated, medium-deep to deep, fairly moist soils. Aspect has only an indirect effect in that the soils of S. slopes are usually shallower and drier than those of other aspects. The indirect effects of topography are important: thus increasing gradient spells increased crown competition among the dominants, and on steep slopes Larch suffers competition not only from its own kind but also from less tall species, specially Beech. On flatter land at the foot of

slopes and on hill-tops, Larch readily outstrips most other species, and though on the rather shallower and drier soils of the latter sites its height is less than on the fertile soil at the foot of slopes, the difference is not so pronounced as in other species. On wind-exposed sites it has an advantage in competition in its propensity for whipping. The great majority of good Larch is found either on relatively flat ground or on hilltops, and in such places the silvicultural measures needed to raise this species should be considerably simpler than on steep slopes.

(2) Larch should not be grown (*a*) on poor sites where even the native species fail to give good yields; (*b*) on sites where the native species yield as well as or better than Larch and need less tending. The best sites for Larch are as described above, especially where Beech is not at its best and where, for climatic or edaphic reasons, the more valuable hardwoods cannot be grown.

(3) Group plantings have been the most successful and are easiest to tend. Mixture by single trees in natural Beech regeneration has usually failed. Larch does well at first in Norway Spruce or Norway Spruce/Silver Fir plantations, but is later overtaken and suppressed. Among the hardwoods its most serious competitors are Ash and Norway Maple, especially the former. Its main silvicultural requirements, besides light and freedom of crown, are effective protection from game in the early stages, and the preservation of a storeyed auxiliary stand of native species in the interests of timber quality and the maintenance of favourable soil conditions.

Given suitable tending, which is on the whole more important in this region than are site factors, there is no reason why Larch should not be successful on many sites in the Jura of Basle.

[149]. 21.0 (569) : 23.1. OPPENHEIMER, H. R. **Natural reproduction of exotic plants in Palestine.** *Repr.* from *Palest. J. Bot. (R. Ser.)* 6 (1), 1947 (14–19).

Natural regeneration of exotic perennial species is usually confined to shady, moist localities. A list is given of exotic species of woody plants and climbers of which spontaneous seedlings have been found at or near Rehovot. [Cf. *For. Abstr.* 10 (No. 85).]

[150]. 21.0 (712.1) : 12.26–8 : 34.26. [LESLIE, H. R.] **Maples for Canada.** *Amer. Nurserym.* 87 (7), 1948 (73–4).

Tests are being made at the experiment station at Morden, Manitoba, to discover the most promising strains of Sugar Maple for cultivation in the prairie provinces. A strain from Minnesota is expected to be the best, since trees in this region are subjected to prairie heat and a rather low moisture supply. Notes are given on silvicultural characters of other species of Maple and their degree of acclimatization in Manitoba.

[151]. 21.0 (78) : 12.26–8 : 12.11.3. WEBB, W. E. **A report on *Ulmus pumila* in the Great Plains region of the United States.** *J. For.* 46 (4), 1948 (274–8). 5 refs.

From a study of the history of oriental Elms that have been planted in the Great Plains, the author concludes that *Ulmus pumila* should properly be called Siberian Elm and *U. parvifolia* Chinese Elm. Trees of *U. pumila* originating from seed collected from the southern part of the natural range in China have been found susceptible to winter killing in the Great Plains. Only the hardy northern strain should be used in future. *U. pumila* flowers about the same time as *U. americana* and at least two hybrids are known, from which cuttings are being taken.

[152]. 21.0 (81) : 12.26–8 : 12.11.3 : 23.2 : 31.0 : 45.3. SAMPAIO, A. N. O aperfeiçoamento dos métodos da cultura do eucalipto no Serviço Florestal da Cia. Paulista de E. de Ferro. **[Improvements in methods of cultivating *Eucalyptus* in the Forest Service of the São Paulo Railway Co.]** Serviço Florestal de Companhia Paulista de Estradas de Ferro, Campinas. 1947. pp. 28 + 6 photos, 1 map, 1 tbl. [Port.]

Outlines the work of the São Paulo Railway Co. Forest Service in cultivating *Eucalyptus*. Their achievements and future programmes in studying and classifying Eucalypt species already introduced, selecting those suitable for fuel, posts, sleepers, charcoal and joinery, and in the formation of nurseries and plantations are briefly described. Experiments in progress for combating pests of *Eucalyptus*, and the lines to be followed in management and technical research, are also discussed. [Cf. *For. Abstr.* 8 (Nos. 1694, 1702–3, 1707).]

21.2. *Moisture Requirements*

[153]. 21.2 : 12.26–8 : 42.31. YOUHOTSKY, M. J. **Hydrological aspect of management survey in the Red Gum areas.** *N.S.W. For. Rec.* 1 (1), 1948 (38–41).

The riverine forests of *Eucalyptus rostrata* along the Murray River are believed to be threatened by water conservation and distribution works which are gradually eliminating the former periodic flooding. The ecological problem involved is to determine whether Red Gum is a flood-loving riverine species which crowded itself on the low-lying river flats or is the hardiest species, which was capable of surviving long floods that eliminated less hardy species. The author indicates the hydrological research which should form part of a management survey designed to answer these questions. [Cf. *For. Abstr.* 9 (No. 1250).]

[154]. 21.2 : 12.26–8 : 12.29 : 11.41.3 : 11.48. LANE, R. D., and MCCOMB, A. L. **Wilting and soil moisture depletion by tree seedlings and grass.** *J. For.* 46 (5), 1948 (344–9). 14 refs.

Seedlings of *Robinia pseudoacacia*, *Fraxinus pennsylvanica lanceolata*, *Bromus inermis* and tomato were planted in pots in the greenhouse on loam and sandy loam, and records were kept of soil moisture depletion, plant development and soil moisture percentages at the stage of permanent wilting. *B. inermis* extracted the most moisture and had the lowest soil moisture % at permanent wilting. Tomato extracted the least moisture and had the highest moisture % at permanent wilting. *R. pseudoacacia* and *F. pennsylvanica lanceolata* held an intermediate position in both respects. The two values referred to appear to be correlated with the dry weight of the roots (for example, *B. inermis* had the greatest root development), and differences in moisture % at permanent wilting are thought to vary with the degree to which the soil is occupied by roots. These differences were more marked in plants on loam than in those on sandy loam.

The more rapid moisture absorption exhibited by the grass, the lower percentage of soil moisture it can endure before wilting and the ability of grass roots to lie dormant in the soil at the wilting point, while trees die, are important factors in establishing plantations on grassy sites. *From authors' summary.* [Cf. *For. Abstr.* 10 (No. 690).]

21.3. *Soil Requirements*

[155]. 21.32 : 12.11.11 : 11.42. UGARTE LAISECA, J. Fitoquimica forestal. Primera parte. Estudio general y de los elementos del grupo A. **[Plant chemistry in the forest. First part. General considerations and a study of the 'Group A' elements.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 18 (37), 1947. pp. 87. [Span.span.f.e.g.]

The first part of a study to examine the relationship between forest vegetation and the chemical composition of the soil. The function of mineral substances in vegetative phenomena will be investigated by:—(1) ash analyses of trees (2) field experiments on the effects of minerals added to or taken from the soil (3) analyses of soils affording optimum conditions for forest growth (4) studying the direct effect of mineral substances on the tree, e.g. by injections.

The ash content of plants varies according to species, different parts of the plant, season, composition of the soil and other factors. These variations, the part played by soil pH in plant nutrition and the quantitative relationship of the various mineral substances within the tree are discussed. The first part of this work ends with individual studies of the 8 elements indispensable to plant growth, their functions and availability.

21.6. *Behaviour in the Stand. Growth Form. Habit*

See also *For. Abstr.* 10 (Nos. 305, 789).

[156]. 21.62 : 12.26–8 (75) : 22.14.2 : 31.8. JEMISON, G. M., and SCHUMACHER, F. X. **Epicormic branching in old-growth Appalachian hardwoods.** *J. For.* 46 (4), 1948 (252–5).

Epicormic branching after partial cuts has tended to reduce the future quality yields of lumber in the Appalachian region. In the study here reported, it was found that significant differences occur in profusion of epicormic branches according to species, site, and position of log in tree. Increased branching following partial cutting is related to original stand volume and intensity of cut, but reduction in value yield is small. A table is given for

computing probable branching in the 6 commonest Appalachian hardwood species.

21.8. *Phenology*

See also *For. Abstr.* 10 (Nos. 76, 741).

[157]. 21.8 : 12.26–8 : 12.11.16 : 34.3. BRIMBLECOMBE, A. R. **The relationship between starch content and flowering of trees as a possible means of predicting honey flows.** *Repr.* from *Australasian Beekeeper* 48 (4), 1946. pp. 4.

A study was made on several species of *Eucalyptus* in Queensland to determine seasonal variations in starch content, along with observations of the occurrence of buds and flowers. Figures of monthly starch determinations for 37 trees of *E. citriodora* from Nov. 1938 to Dec. 1941 showed considerable seasonal fluctuation but this was not regular. Concurrent flowering records for these and 40 trees of *E. maculata*, suggest that peaks of starch content precede bud formation. On the other hand, comparison of graphs of mean starch content for a tree that did not flower with one that flowered heavily twice during the 3-year period, shows a striking correspondence between the two. Similar data are given for individual trees of *E. punctata*, *E. crebra* and *E. propinqua*. The sum of evidence indicates in some instances a possible relationship between a build-up of starch and the development of flower buds, which might be used to predict flowering of trees, but also serious inconsistencies to the existence of such a relationship. Some other factor, such as rainfall, may be masking the correlation, and further investigations will be made. [Cf. *For. Abstr.* 10 (No. 635).]

[158]. 21.8 : 56.02 : 12.19 : 21.0. DAUBENMIRE, R. F., and DETERS, M. E. **Comparative studies of growth in deciduous and evergreen trees.** *Bot. Gaz.* 109 (1), 1947 (1–12). O.B.D.

Radial changes in 8 evergreen conifers, 1 deciduous conifer and 8 deciduous dicotyledons were studied over a period of 2 years in an arboretum at Moscow, Idaho. Growth for the 8 evergreen conifers and the 8 deciduous dicotyledons began approximately at the same time. In the early part of the grand period of growth the evergreens grew more rapidly, but in the later part the relation was reversed. The evergreens shrank most in response to drought during the summer. Very slow enlargement took place in nearly all species during autumn and winter, but it was often interrupted by periods of shrinkage. In a few cases swelling was partly a rehydration of tissues which had suffered a marked shrinkage during the preceding summer. In other cases it was probably due to the belated hydration of cells produced in summer. The radii of evergreens were less stable during winter than those of deciduous trees, a phenomenon which is probably related to needle retention. The radial behaviour of the deciduous conifer *Larix occidentalis* did not consistently parallel either of the two groups, but it closely resembled the dicotyledons in its radial stability during winter and its early foliation in spring. The inclusion of *Pinus ponderosa*, *Pseudotsuga taxifolia* var. *glauca* and *Picea engelmannii* provided an opportunity for comparing the behaviour of species native to low, intermediate and high altitudes of the Rocky Mountains, but no consistent differences in behaviour were found that could definitely be related to altitudinal distribution. *P. ponderosa* showed a pronounced autogenous retardation of growth in early summer but did not seem as greatly affected subsequently by the normal summer drought as the species from higher altitudes. This seemed to be a peculiarity of the species, however, rather than an adaptation to climate. Radial behaviour in *Pseudotsuga taxifolia* (native to the Pacific Coast) and *P. taxifolia* var. *glauca* (from the Rocky Mountain region) differed considerably but inconsistently. The growth of the trees from the coast slowed down earlier in the summer and they shrank less in response to late summer drought. This indicates a greater degree of xerophytism in the Pacific Coast trees than would be expected, but this difference in behaviour may have resulted from ecotypic specialization. In general, the leaves of the deciduous trees were nearly fully developed before the new foliage of the evergreens appeared. Growth began before the frost season had ended and stopped well in advance of the first frost in autumn. *Robinia pseudoacacia* was unique in exhibiting a marked shrinkage, amounting to about 30% of its net annual increment, which took place abruptly after the grand period of growth had ended in both summers. In 1945 this shrinkage was not made up until the following February or March. *From authors' summary.*

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

See also *For. Abstr.* 10 (Nos. 130, 156, 174, 176–9, 182, 184, 308).

[159]. 22.1 : 01.2. PHILLIPPIS, A. DE. Su alcune forme di trattamento delle fustaie. **[On certain forms of silvicultural system for the management of high forest.]** *Ital. for. mont.* 3 (1), 1948 (3–10 + 2 photos). [It.]

Explains the various meanings attached to, and confusion arising from the loose use of the terms group system (*tagli a gruppi*), which may mean (1) clear felling by groups, (2) group system proper, (3) group selection; and strip system (*tagli marginali*), which may mean (*a*) clear felling by strips, (*b*) shelterwood strip system, (*c*) Wagner's *Blendersaumschlag*.

[160]. 22.12.2. : 12.25 : 42.1. **Alternate clear-strip cutting in Lodgepole Pine.** *Rep. Rocky Mt. For. Range Exp. Sta. 1947*, 1948 (28–32).

The alternate clear-strip cutting system is particularly well adapted for the management of mature or over-mature, uneven-aged stands of *Pinus contorta*. If cutting to a 10-in. diameter limit is practised, the alternate strips protect the young residual stand from windthrow. The system also has advantages for fire protection and game management. On sites that will grow Alpine Fir or Spruce, it favours regeneration of Lodgepole Pine. Clear strips should not exceed 150 ft. in width, and long unbroken strips should be avoided on account of fire hazard. To obtain maximum protection from wind in level or rolling country, strips should run at right angles to the prevailing direction of damaging winds, but in mountainous country they should run up and down the slopes, since wind movement is always at right angles to the direction of the slope. This arrangement also diminishes logging damage to advance growth.

[161]. 22.14.2 (471) : 94.3 : 23.1 : 57 : 65. SARVAS, R. Tukkipuun harsintojen vaikutus Etelä-Suomen yksityismetsiin. **[Influence of selective cutting for sawlogs on the private forests of S. Finland.]** *Commun. Inst. for. Fenn.* 33 (1), 1944 (1–268). 13 pp. of refs. [Fig.]

Reports in detail the results of extensive studies made in 1937–40 on the influence of former selective sawtimber fellings on the growing stock and on natural regeneration in some of the chief forest types of the region, viz. Scots Pine (*Calluna* and *Vaccinium* (dry heath) types), Scots Pine/Norway Spruce (*Vaccinium* (dry heath) type), Norway Spruce (*Myrtillus* and *Oxalis-Myrtillus* (moist heath) types), and Scots Pine/Birch (*Myrtillus* and *Oxalis-Myrtillus* types). In a closing section on silvicultural consequences it is pointed out that artificial regeneration will probably be necessary in all but the pure Norway Spruce forests.

Captions, table headings, etc. are translated into German.

[162]. 22.14.2 (471) : 23.1 : 65 : 12.25. SARVAS, R. Huomioita kaivospuun ja paperipuun määrämittahakuilla käsitellyistä metsiköistä. **[Notes on stands cut to minimum diameter for pitprops and pulpwood.]** *Commun. Inst. for. Fenn.* 33 (2), 1946 (1–27). 12 refs. [Fi.e.]

Sets forth the results of sample-plot measurements made in 1938–39 in connexion with the author's work on selective sawlog fellings [see preceding abstract], to elucidate the effects of the former intensive cutting of pitprops and pulpwood to a diameter limit (averaging only about 10 cm. d.b.h. and usually involving the liquidation of 75–90% of the trees in the stands). The stands examined were so cut in early middle age. In those cut for pitprops Scots Pine was the dominant tree, and in those cut for pulpwood, Norway Spruce. The cut-over Pine stands had an average stocking of 35 cu.m./ha. and a mean increment of 1·5 cu.m./ha. Too few Spruce plots were measured to give a reliable average, but the figures indicate a higher stocking and possibly greater ability to recover from sudden opening of the stand. It may be worth while to preserve residual stands of the latter species if their condition is fair and the site good. Natural regeneration was slow and poor in Pine but fairly satisfactory in Spruce.

Table headings, etc. are given in English.

[163]. 22.14.2 : 12.25 : 56 : 24.36. **Growth following light cuts in virgin Ponderosa Pine.** *Rep. Sthwest. For. Range Exp. Sta.* 1947 (41–3).

One 72-acre area was 'salvage' logged, taking out about one-third of the volume, and two tracts

of 80 and 72 acres respectively were cut under 'improvement selection', removing slightly over half the volume. Records of increment, mortality, etc. kept for the 5 years after logging indicate that, while light cuts are effective in promoting a high rate of initial growth, neither method of cutting nor the leaving of a high reserve volume will in themselves assure a high rate of volume increment.

[164]. 22.14.2 : 12.26–8 (774) : 65.7 : 56. **Optimum stocking for northern hardwoods under the selection system of management.** *Rep. Lake St. For. Exp. Sta.* 1947 (16–17).

The 15-year growth records for various cuttings (varying from clear cutting to a cut of about 25%) in the Upper Peninsula Exp. Forest, Dukes, Mich., were analysed, and it was found that maximum increment was obtained when the residual stand left after selective logging amounted to 6,000 bd. ft. per acre. Growth % was inversely proportional to residual volume, but the high percentages for very low growing stock do not represent recoverable volumes, because of light stand per acre, small material and poor quality. In the range recommended (4,500–7,000 bd. ft. per acre residual stand) the growth % ranged from 2·9 to 4·5.

[165]. 22.14.2 : 12.26–8 (774) : 65.7 : 76. ZILLGITT, W. M. **Optimum economic stocking for northern hardwoods.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 10, 1948. pp. 14. 5 refs.

Residual stockings after 8 different degrees of selective cutting were analysed from the point of view of interest earned on the forest investment. A residual volume of 3,500 bd. ft. (44 sq. ft. of basal area) per acre in trees of 10 in. d.b.h. and over, with a cutting cycle of 15 years, was the best investment, earning 3·6% compound interest. *From author's summary.*

22.2. *Coppice Forest*

See also *For. Abstr.* 10 (Nos. 171–2).

[166]. 22.2 : 12.26–8 (678) : 23.24.3. **Coppicing and pollarding of *Cassia siamea*.** *Rep. For. Dep. Tanganyika 1945*, 1948 (20).

Experiment showed that coppicing gives better results than pollarding in *Cassia siamea* plantations and should therefore be adopted as standard practice except where grazing is heavy. The best season for coppicing and pollarding was found to be May. Grades of thinning in coppice and pollard *Cassia* were also investigated. Closer spacing (6 × 6 ft.) was found to be best; with spacing increased to as much as 18 × 18 ft., regrowth was very poor.

[167]. 22.21 (44) : 4 : 56.02 : 56.2 : 76 : 57. PERRIN, H. Étude statistique sur les taillis sous futaie. **[Statistical study of coppice with standards.]** *Ann. Éc. Eaux For. Nancy* 10 (1), 1946 [1947] (1–102). 33 refs. [F.f.]

This detailed study is based on statistical material collected over a long period, mainly in the Saône valley, by the late chief inspector, de la Hamelinaye. It is divided into the following chapters: (1) general description of the forests studied; (2) natural wastage of the reserved stand in the course of a rotation; (3) girth increment of reserved standards; (4) volume increment of the reserved stand; (5) economic data; (6) development of stands; (7) summary and conclusions.

(1) The forests are divided into 5 groups, according to their soils, and the principal species of standards and underwood are indicated for each. In general, Oak (either Pedunculate or Sessile) is the most important species for standards.

(2) By far the greater part, sometimes the whole, of the loss of stems in the reserved stand in the course of a rotation, occurs among the tellers (standards of 1st rotation), and it varies greatly from one forest to another and even from one coupe to another in the same forest; the most serious cause is windthrow. Variation in soil was found to have some effect on wastage, apparently as a result of greater or less stability and possibilities of root development. Other things being equal, wastage increases with increasing altitude after about 400 m. and becomes very large above 500 m. In the plains it varies directly with the area of the coupe, but this correlation is much less regular in the mountains. The length of coppice rotation, which determines the diameter, and therefore the wind resistance, of the tellers, has a decided and constant influence on the losses of standards in the next rotation. For example, in the Saône valley, south of Dijon, coppice cut at 20 years loses 18%, at 25 years 10%, and at 37 years 7–8% of such standards. In good to medium soils, losses are

fairly evenly divided between species, but in poorer soils Oak is much the least vulnerable. The practical application of these facts is to limit the area of coupes to a maximum of 10 ha., to allow no rotations below 25 years, and no coppice with standards above 400–500 m.

(3) The average girth increment for Oaks in 25 years varied from 45 to 20 cm. for veterans (standards of 4 rotations) and from 50 to 25 cm. for standards of 2 and 3 rotations. There is some evidence that shorter coppice rotations accelerate the girth-increment rate of standards.

(4) The current belief that Oak standards grown as coppice with standards on coppice rotations of 25–35 years, double their volume between one cut and the next, is seldom true, save within narrow limits of age and material; in fact, the rate of volume increment varies widely.

(5) The mean annual increment of coppice, when not suppressed by a too abundant overstorey, varies at 25 years from 5·65 cu.m. to 2·65 cu.m. per ha. according to site quality. If the m.a.i. of the branchwood of the reserved stand be added, we get totals of 6·55 cu.m. to 3·19 cu.m., which may be taken to represent the yield that simple coppice would produce on the same site. The m.a.i. of stem wood in the reserved stand at 25 years varies between 0·8 and 2 cu.m., depending on its initial volume; round figures are 1 cu.m. for an initial volume of 15–20 cu.m., 1·5 cu.m. for 30–35 cu.m., and, exceptionally, 2 cu.m. for 50–60 cu.m. The practical consequences of this lowering of the coefficient and rate of increment parallel to the rise in initial volume are important, particularly on the rate of interest. It is shown that the rate of interest increases with site quality and decreases (though more slowly than the volume-increment rate) with increasing reserved stand-volume and length of rotation. The best rate of interest that can be obtained is 3·7–3·5% (mean gross rate) corresponding to coupes of an initial value of 2,000–4,000 fr. per ha. according to site quality, representing a reserved stand of 50–60 tellers, 30–40 standards of 2nd and 3rd rotations, and 5–8 veterans, per ha.

(6) The section on stand development deals mainly with the regression of Oak (rapid in the case of Pedunculate and slow in that of Sessile Oak), and it is shown that both silvicultural and economic considerations are against too large a reserve stand.

The final conclusion from this study is that the optimum volume for the reserved stand in coppice with Pedunculate Oak standards is 20–25 cu.m. of standing stem wood per ha. after the cut, and slightly higher for Sessile Oak, which corresponds to a mean annual increment of 1·25–1·50 cu.m. per ha.

[168]. 22.21 : 12.26–8 (44) : 23.6. GRAFFIN, M. L'envahissement du charme dans les taillis sous futaie. **[Hornbeam invasion of [Oak] coppice with standards.]** *Action for. pisc.* No. 127, 1948 (3). [F.]

Hornbeam is a serious menace to Oak regeneration on cool, permeable clay-sand soils, and the usual remedy, namely successive cleanings to liberate the Oak, is too expensive in labour to be practicable nowadays. The author has experimented successfully with planting Poplar immediately after felling the Oak on such sites, and finds that, though its growth is somewhat slowed up, the Poplar still develops sufficiently rapidly to get away from the Hornbeam, which remains as an understorey and provides natural pruning for it.

[169]. 22.22 : 12.26–8 (45) : 23.1 : 12.11.22 : 56.2. BANTI, G. Un sistema di taglio della Robinia nella Brughiera lombarda. **[A system of harvesting Robinia practised in the Lombard bush country.]** *Ital. for. mont.* 3 (1), 1948 (41–5). [It.]

A comparison was made of the wood production of *Robinia pseudoacacia* (1) when coppiced in the ordinary manner, (2) when the stumps were dug out and the holes filled with earth. The results were as follows: (1) volume per ha. after 1 year 3·726 cu.m., after 3 years 11·210 cu.m.; (2) volume per ha. after 1 year 4·247 cu.m., after 3 years 30·929 cu.m. In addition to a yield 175% higher in 3 years, the sucker growth obtained by digging out the stumps was also better distributed, more resistant to windthrow and snow damage, and more vigorous than the stool shoots from the old stools weakened by frequent cutting. The value of the stumpwood thus obtained was also considerable.

[170]. 22.22 : 12.26–8 : 57 : 24.25 : 33.06 (676). WIMBUSH, S. H. **Blue Gum coppice for wood fuel.** *E. Afr. agric. J.* 13 (3), 1948 (167–9).

Report on a study made to determine whether the greatest yield of firewood is

obtained by the usual practice of retaining the three best stems in *Eucalyptus globulus* coppice; or by a further thinning to two, or even one stem per stump. The coppice in 6 experimental plots was thinned to 3 stems per stump at 18 months old; 6 months later, coppice shoots in 2 of the plots were further reduced to 2 per stump, and in two other plots to 1 per stump. At 9 years old, when the plots were nearly due for felling for railway fuel, the stems were measured. Data derived from measurements are given in a table. The conclusions drawn from the experiment are as follows:— (1) On a rotation of 9–10 years, the same yield of wood may be expected from 1-stem as from 2-stem or 3-stem coppice. (2) Straighter stems are likely to be obtained from 1-stem coppice; trees carrying 3 stems per stump are particularly liable to be crooked. (3) A good average size of billet suitable for fuel is obtained in 9–10 years from 2-stem coppice. The butts of 1-stem coppice are rather large for locomotive fuel, and need to be split. Coppice grown with more than 2 stems per stump yields a high proportion of thin billets which require more handling and burn quicker.

It is therefore recommended that Blue Gum coppice should be grown with 2 stems to every original stump for firewood. If, however, there is any possibility of the trees being required for poles or timber, only one stem should be left.

The first thinning of coppice shoots should be done when the growth reaches about 20 ft. in height, the 3 best shoots being left and the rest cut or pulled off the stump. A year later, the weakest of the 3 shoots should be removed, leaving 2 good stems per stump, or, in the circumstances mentioned above, this second operation should remove 2 stems, leaving a single strong stem on every stump.

22.6. *Changes of Silvicultural System*

[171]. 22.6 (494) : 60.31. LEIBUNDGUT, H. Über die Planung von Bestandesumwandlungen. **[Planning the conversion of stands [to other silvicultural systems or species].]** *Schweiz. Z. Forstw.* 98 (10/11), 1947 (372–89). [G.f.]

An exposition in general terms of: (1) The need for a sound ecological basis in silviculture. (2) The necessity of thorough-going co-ordination of silvicultural measures during conversions, with particular reference to the rating of stands according to their need of conversion, the vital importance of long-term planning on broad lines only, supplemented by a flexible short-term treatment adjusted according to the results of frequent revision, and the advantages of natural regeneration.

In illustration of these principles a brief account is given of the conversion plan in operation in the instructional forest of the Swiss Federal Technical College, with details of conversions in progress in two of its compartments.

It is estimated that at least 250,000 ha. of Swiss forest (coppice, coppice with standards, high forest composed of unsuitable species) are in need of conversion.

[172]. 22.6 (494) : 22.21 : 60.31. VOEGELI, H. Vom Mittelwald und seiner Unwandlung in Hochwald. **[Coppice with standards and its conversion to high forest.]** *Schweiz. Z. Forstw.* 98 (10/11), 1947 (389–402). [G.g.f.]

Owing to their resemblance to natural forest (little artificial regeneration, comparative absence of species or races unadapted to the site, little manipulation of composition), many areas of coppice with standards are valuable for studies of silvicultural, ecological and soil problems, as well as affording potential sources of seed of unimpeachable suitability for the locality. Such areas, if well stocked and showing good growth, should be preserved by conservative treatment.

Where these conditions do not obtain, conversion to high forest should be undertaken. Rational conversion demands detailed but flexible planning, with frequent (even annual) revision of the situation, and the forester must have intimate knowledge of the area and stands concerned. Where possible, indirect conversion (by natural regeneration) should be aimed at. If the standards are of poor quality, however, artificial regeneration will be necessary and due attention should be paid to the use of seed and plants of suitable origin.

[173]. 22.6 (494) : 12.25 : 12.26–8 : 11.47.2 : 12.19.2. FANKHAUSER, F. Waldtypen und Umbaufragen im bernischen Mittelland. **[Forest types and conversion problems on the Bernese plateau.]** *Schweiz. Z. Forstw.* 98 (10/11), 1947 (402–19). [G.f.]

With special reference to the urgent need for restoring fertility in soils impoverished by unsuitable species, and especially for converting pure Norway Spruce to Oak on natural Oak sites. Special emphasis is laid on the necessity of soil and ecological studies as an essential basis of silvicultural planning.

23. FORMATION OF STANDS

[174]. 23 : 12.25 (436 : 437) : (436 : 437) : 22.1 : 22.83. FRÖHLICH, J. Aus der Praxis der künstlichen und natürlichen Verjüngung der Gebirgswälder. [**Practical experience of artificial and natural regeneration in mountain forests.**] *Allg. Forst- u. Holzw. Ztg.* 58 (1/2; 3/4), 1947 (7–9; 17–19). [G.]

The author, who has had 40 years' experience in the mountain forests in Austria, the Carpathians and Bosnia, believes that clear felling with artificial regeneration is justified only at high altitudes, in the pure Norway Spruce forests. Nurseries for this species have often been situated too far out of its natural range (optimum in this region 1,000 m. altitude and over); the stock raised has been unthrifty, has needed watering (unnecessary in nurseries at high elevations) and has suffered from the long transport involved between nursery and planting site. Storage of planting stock is best done in 'snow-pits' in the vicinity of the felling area. These, 1 m. deep, are dug in autumn, filled in winter with snow, and stamped firm. By spring the snow has turned to ice, on which the plants are stored, with a roofing of Spruce or Fir branches. Seedling stock is quite satisfactory if properly grown. On good, moist humous forest soil, sufficiently strong plants can be raised in 3–4 years without transplanting, in drills 20–25 cm. apart. During this period it will be necessary to thin them to 30–35 per running metre. Where millions of plants are to be put out in their natural habitat, transplants are a luxury. The number per ha. should be 3,000 for good sites at the middle altitudes, formerly under Beech, and 4,000 for the higher levels. Grass competition may be severe on the latter sites, hence planting holes may need to be 60–70 cm. wide and the grass may have to be cut for several seasons after planting.

Little success has been achieved with natural regeneration of pure coniferous stands. On the other hand, in mixed woods with at least 30% of Beech, selection or shelterwood fellings have given satisfactory natural regeneration, needing to be supplemented artificially to the extent of 25% at most. Not only Norway Spruce and Silver Fir but also valuable hardwoods will regenerate under Beech. Efforts should be made to maintain and extend the proportion of Beech at the middle and lower altitudes, which originally carried mixed Beech/Spruce/Silver Fir, with the object of abolishing clear felling and securing natural regeneration in mixed woods of more natural composition.

[175]. 23 (671) : 96 : 97 : 12.26–8. AUBRÉVILLE, A. À propos 'Les pays tropicaux' de Pierre Gourou: Le parasolier: La régénération naturelle et l'enrichissement de la forêt équatoriale. [**Notes on 'Les pays tropicaux' by Pierre Gourou: [regeneration of] *Musanga smithii* : Natural regeneration and the improvement of equatorial forest.**] *Bois For. Trop.* 4 (4), 1948 (20–30 + 2 photos). [F.]

Cf. *For. Abstr.* 9 (Nos. 1481, 2161).

23.1. *Natural Regeneration*

See also *For. Abstr.* 10 (Nos. 101, 149, 160–2, 599).

[176]. 23.1 (595) : 22.11. WALTON, A. B. **Some considerations for the future management and silvicultural treatment of Malayan forests.** *Malay. Forester* 11 (2), 1948 (68–74). 2 refs.

There is evidence that natural regeneration in virgin forest in Malaya is usually present in sufficient quantity to permit the removal of the timber crop in a single operation. One, or at most two, cleanings after the felling will be sufficient to ensure the development of the regeneration and to effect an improvement in the quality of the forest. The retention of seedbearers is of little practical value as a means of ensuring successful regeneration. What is necessary is to ascertain, by sampling, that sufficient regeneration is present before exploitation begins. It is suggested that 20–30% stocking with well distributed regeneration above 5 ft. high, is normally sufficient.

[177]. 23.1 (471) : 12.25 : 12.26–8 : 22.1 : 91.3 : 11.62 : 11.22. LUKKALA, O. J. Korpimetsien luontainen uudistaminen. [**The**

natural regeneration of the *korpi* forests (Spruce/Birch peatland types).] *Commun. Inst. for Fenn.* 34 (3), 1946 (1–150). 69 refs. [Fi.g.]

A detailed report on studies, made from 1936 to 1942, of natural regeneration in *korpi* forests (wet Spruce/Birch types on peatland with few undershrubs and a moss layer composed chiefly of *Sphagnum* spp. and *Polytrichum commune*), mostly in areas where alternate clear-strip fellings had been made in 1925–30, but also on some where rather large clear fellings, shelterwood, irregular shelterwood, and selection fellings had taken place. The observations included measurements of groundwater level, precipitation and its interception, and the influence of the forest on air and soil temperatures. Changes in the ground flora after fellings, and seed and litter fall in various stands, were also studied.

In general, natural regeneration was good on the strip fellings, which bore an average of 24,100 seedlings per ha., of which 79% were Birch and 19% Norway Spruce. Over 75% of the Birch had come in after the fellings, whereas 64% of the Spruce represented advance growth. Regeneration was poorer on the drier types (transitions to heathland). Studies of the intervening strips of old forest and of the results of shelterwood and selection fellings are also described.

The uniform system is unsuitable for these forests, owing to the occurrence of windthrow. The selection system is undesirable owing to the slowness of regeneration and the pure Spruce stands that result. Irregular shelterwood methods are appropriate in some cases, especially where the existing forest is irregular. The treatment recommended is a modified alternate clear-strip system in which: (1) A seeding felling is made by opening the canopy sufficiently to permit advance growth of Norway Spruce to become established. (2) When adequate seedlings are present alternate strips, 40–50 m. wide and separated by old forest in strips of equal width, are clear-felled. On these, abundant Birch regeneration will occur and will quickly form a nurse crop for the Spruce. (3) About 15 years later, when the young Birch will be 3–4 m. high, the intervening strips are clear-felled, except possibly for a few seedbearers of Birch, though the young Birch crops should by this time be able to supply much of the seed.

This system results in a somewhat uneven-aged Spruce/Birch forest over the whole area. As Birch is now in much demand, thinnings would be marketable and it should be simple to keep the Spruce in good growth.

Table headings etc. are given in German as well as Finnish.

[178]. 23.1 : 22.15 (71). Long, H. D. **The prevention of regeneration failures of pulpwood species.** Pulp Paper Res. Inst. Can. 1947. pp. 5.

During the summer of 1947 an investigation of cut-over pulpwood lands in several localities in eastern Canada was conducted by the Pulp and Paper Research Institute of Canada in co-operation with six member companies of the Canadian Pulp and Paper Association. The main object of the investigation was to determine what measures should be adopted to prevent regeneration failures. Several cut-over conditions were inspected in six different localities, the site conditions and state of re-stocking were noted and obvious fail areas were studied in some detail.

The causes of regeneration failure were determined from these observations and possible changes in operating practice to prevent these failures were considered. It was concluded that most of the observed regeneration failures could have been prevented by a few changes in operating practice. Among the changes suggested as a departure from the common clear-cutting practice were: clear-cutting in narrow progressive or alternate strips; selective cutting of the larger trees of the stand, leaving the residual stand of smaller trees dense enough to prevent blowdown; selective logging of conifers in mixed hardwood/conifer stands, skidding the timber in log lengths and reserving seed trees; girdling or otherwise killing hardwood seed trees to give the conifers a better chance to regenerate cut-over mixed hardwood/conifer stands; in the case of Jack Pine, lopping and scattering of cone-bearing slash and scarification of the seedbed; managing Spruce on a long rotation and Jack Pine on a short rotation. *Author's summary.*

[179]. 23.1 : 12.25 (718) : 56 : 22.14.2. **Growth of Balsam Fir in Newfoundland.** *Pulp Paper Mag. Can.* 49 (3), 1948 (280, 284, 286).

On high-quality sites in Newfoundland, clear cutting of Balsam Fir results in regeneration at

the rate of more than 40,000 seedlings per acre, which at 10–15 years is reduced by natural mortality and self-thinning to 4,000–5,000 seedlings per acre, spaced at intervals of 2–3 ft. Thereafter, natural mortality is very light and growth rate becomes increasingly retarded by suppression. When reproduction is restricted or reduced in early years to 2,000 or 2,500 seedlings per acre, spaced 3–4 ft. apart, stands of an average diameter of 10 in. can be grown in 60 years. It is suggested that the best way of effecting this is selective cutting to a diameter limit (6–7 in. being indicated by experiments), with latitude sufficient to leave a uniform residual stand, so as to regulate the amount of regeneration to optimum density. The Anglo-Newfoundland Co. has established experiments to study the value of cutting to a 6·5-in. d.b.h. limit.

[180]. 23.1 : 12.25 (944). LINDSAY, A. D. **Notes on the Cypress Pine regeneration problem.** *N.S.W. For. Rec.* 1 (1), 1948 (5–16).

A detailed review on the problem of natural regeneration of *Callitris glauca* in New South Wales, which is rather different in the north and the south of the area. Necessary administrative measures include classification of Cypress Pine forests in terms of regeneration urgency, exclusion of grazing from forests urgently requiring regeneration, completion of fencing, extermination of rabbits, fire protection, supplementary restocking of gaps by artificial methods, treatment of soil (e.g. light ploughing or harrowing), removal of older stands, thinning etc. of developing young stands. The necessity of keeping careful records of seed production, germination and seedling development, is emphasized and the conclusions so far reached from detailed observations on germination and development of seedlings are given. Promising lines for future investigation are indicated.

[181]. 23.1 : 12.25 : 60.1 : 97.3. **Relation of bunch grass forage cover to growth of Pine reproduction.** *Rep. Sthwest. For. Range Exp. Sta.* 1947 (24–5).

A note on invasion by Ponderosa Pine, since 1919, of plots protected from grazing since 1912, with consequent progressive suppression of grass.

[182]. 23.1 : 12.25 (410) : 22.1 : 12.19.23. JONES, E. W. **Scots Pine regeneration in a New Forest Inclosure (*Pinus sylvestris* L.).** *Forestry* 21 (2), 1947 (151–78). 4 refs. [Department of Forestry, University of Oxford.]

A study of natural regeneration of *Pinus sylvestris* in Buskett's Lawn Inclosure in the New Forest. Strip fellings (100-ft.-wide strips, clear felled, alternating with 60-ft.-wide strips left intact) and shelterwood fellings leaving 20–25 trees per acre, were made during the winter 1940–41. Shelterwood fellings in one compartment were left until the summer of 1941 and the following winter.

Estimates of cone production and seedling counts show an almost complete cessation of seed production for a few years following the felling in the shelterwood areas. It is not clear whether this was due to the felling or the normal periodicity of seed years. Differences in seedling density in the various compartments, and especially the poor regeneration in the late-felled compartment, illustrate the importance of felling in time for the establishment of seedlings, and of keeping trees with well developed crowns for seedbearers. The general success of natural regeneration in the Inclosure seems to be due to the seeding felling coinciding with a good seed year.

Regeneration was best in the strip fellings, but this may be because operations were completed slightly earlier. However, the strip system may be preferable to the shelterwood when the density of the intact strips is enough to keep ground vegetation very scanty, and when, at the same time, a strong side-light permits abundant establishment of Pine seedlings.

Although *P. sylvestris* is often regarded as having considerable ability to establish itself among competing vegetation, the seedlings in the Inclosure seem to have appeared only where there was bare humus, mineral soil, or some kind of moss carpet. A very close relationship exists between the abundance of seedlings and both density and composition of phanerogam cover. There is some evidence that *P. sylvestris* is able to enter closed vegetation only beneath *Calluna* and *Erica tetralix*. Ease of regeneration is intimately related to the speed with which the ground becomes covered with rank-growing vegetation, such as *Molinia*, *Rubus fruticosus* and *Pteridium aquilinum*. Dense and luxuriant *M. coerulea* prevents the entry of fresh Pine seedlings at least as effectively as *P. aquilinum*, but is less likely to

suppress established seedlings. Dense and tall *P. aquilinum* offers a great obstacle to both germination and growth, but, when not vigorous, may be less unfavourable than *M. coerulea*, at least in the earlier stages. Admixture of either with *Calluna vulgaris* gives more favourable, and with *Rubus fruticosus* agg., less favourable conditions.

[183]. 23.1 : 12.25. STAEBLER, G. R. **Predicting stocking improvements in production stands of Douglas Fir.** *For. Cl. Quart.* 21 (2), 1947/8 (21–6).

A study was made in 1946–47 of site factors —brush cover, slope, exposure—in natural regeneration areas of Douglas Fir in Washington, in order to define the influence of these factors on the percentage of improvement in natural regeneration to be expected within a space of 15 years. The whole area studied had a good seed source and had not been disturbed by fire, cutting or heavy grazing. On all slopes having favourable exposures with a light to medium brush cover, the percentage of possible improvement occurring within 15 years was 55, and with dense brush cover, 34. On unfavourable exposures the greatest possible improvement (38%) is to be expected on 15–40% slopes with light to medium brush cover. On slopes over 40% with unfavourable exposures, only 26% improvement can be expected, whatever the brush cover. A table gives predicted stocking after 15 years in understocked stands of various types. With such data it should be possible to predict the population to be expected within 15 years and to plant promptly on unfavourable sites.

[184]. 23.1 : 12.26–8 (714). LINTEAU, A. **Factors affecting germination and early survival of Yellow Birch (*Betula lutea* Michx.) in Quebec.** *For. Chron.* 24 (1), 1948 (27–86). 76 refs.

Three stations were established in 1943 for the purposes of this study: (1) in an uncut 70-year-old stand, (2) in a similar stand from which 40% by volume had been removed, and (3) a clear-cut area. The resulting variations in microclimate were reflected in considerable differences of germination, growth and survival of the seedlings.

More seed germinated under canopy than in the open, probably owing to higher soil moisture, but germination in all 3 sites was much lower on litter than on exposed mineral soil. The physical structure of litter and its wide variations in temperature and moisture are held responsible for this. The average germination value per quadrat was 15 seedlings in full shade, 62 in part shade, and 2 in the open; on mineral soil, in the same order, the values were 233, 273, and 92. After 2 growing seasons, no seedlings remained on the litter surface except at the partial-shade station (13% survival). Survival percentages on mineral soil were 2% in full shade, 27% in part shade and 69% in the open. The height reached by the seedlings at the end of the 2nd growing season in the open, part shade, and full shade stations was 10·86, 3·52, and 1·47 in. respectively. Seedling losses were relatively high during the first growing season. The main factors responsible were high surface temperatures, drought, late frosts, mechanical injuries, insects and rodents.

It is concluded that the best system for obtaining good regeneration of Yellow Birch is partial cutting, removing 30–50% of the stand volume. A group selection system might be better still. Mechanical logging, which tends to expose the mineral soil, should encourage plentiful germination. With clear cutting, lopping and scattering of the slash is desirable in order to prevent the soil from drying out too quickly.

[185]. 23.13 : 12.25 : 32.29.2. [DJERF, H. E.] **The effect of slash disposal on reproduction in Black Spruce.** Pulp Paper Res. Inst. Can. 1947. pp. 2.

Report on a study of sample plots in Minnesota. Better reproduction was found on clear-cut tracts where the slash had been lopped and scattered than where the slash had been left unlopped. Reproduction on partially cut tracts was usually considerably better than on clear-cut tracts. The reproductive potential of partially cut tracts appears to be sufficient to mask the effect of slash-disposal method. [Cf. *For. Abstr.* 8 (No. 2377).]

[186]. 23.13 : 12.25 : 32.29.2. **[Slash disposal and regeneration of Lodgepole Pine.]** *Rep. Rocky Mt. For. Range Exp. Sta. 1947*, 1948 (36).

Although stocking per acre is slightly less when slash is lopped and scattered than when it is piled and burned, the density of the seedling stand is more nearly optimum. An accumulation of slash, where not too dense, tends to

reduce the number of seedlings, reproduction is more uniformly distributed, and there is less likelihood of strong competition in the young stand and consequent need of thinning. A survey of burned spots after piling and burning of slash showed that such spots usually did not exceed 8 ft. in diameter and that about half of them were stocked with one or more seedlings, while the other half had none.

[187]. 23.13 : 12.25 : 11.42 : 12.19.23 : 44.1. Germeten, F. Vegetasjons- og jordundersøkelser av markberedningsfelter. **[Investigations of the vegetation and soil of screefed areas.]** *Medd. norske Skogforsøksv.* 9 (4) (No. 34), 1947 (393–458). 15 refs. [Nor.e.]

Describes studies made in the Stange and Løten districts in S.E. Norway, to determine the composition of vegetation invading screefed patches (mostly under shelterwood in Scots Pine forest of *Vaccinium* types), the time elapsing between screefing and invasion, the likelihood of such vegetation interfering with natural regeneration of Scots Pine and Norway Spruce, and differences that might exist between screefed and intact areas in soil pH, humus content, nitrate content, and NH_4Cl-soluble Ca. The data are tabulated in detail; legends of tables are translated into English and there is a 7-page English summary.

[188]. 23.13 : 12.26–8 (728). Sierra, H. M. Los encinos de Guatemala y America central. **[The Oaks of Guatemala and Central America.]** *Rev. agric., Guatemala* 2 (21/26), 1946 (319–21). [Span.] E.M.B.

A botanical description with a discussion of advantages and disadvantages arising from burning the stands after felling.

23.2. *Artificial Regeneration*

[189]. 23.2 (713). Zavitz, E. J. **Reforestation in Ontario.** Department of Lands and Forests, Ontario. [1947?]. pp. 31. *Repr.* from *Canadian Geographical Journal*, Apr., 1947.

[190]. 23.2 : 12.25 : 43.11 : 76.1. Elliott, F. A., and Pomeroy, K. B. **Artificial regeneration of Loblolly Pine on a prescribed burn.** *J. For.* 46 (4), 1948 (296–8).

A test of clear cutting, burning, and planting as a way of regenerating *Pinus taeda* has been made in Virginia, with the object of determining the effectiveness of prescribed burning in preparing a good seedbed and reducing competition, and the total cost in man-hours of burning, and planting or direct sowing. Two-month-old slash did not burn well enough on a Class 3 fire day to permit the subsequent use of furrowing equipment or a mechanical tree planter, and the fire did not consume the greater part of the duff and surface-root mat. Of the hardwoods 99% were killed back to the ground, thus giving planted Pine an even start with competing hardwood sprouts which came up the following spring. The total cost and labour charge of burning and planting at the rate of 600/acre was $10.68 and 10·29 man-hours respectively per acre. For burning and direct sowing the comparable figures were $7.64 and 7·89 man-hours. Both costs were within the calculated permissible expenditure.

[191]. 23.2 : 12.26–8 (672.1) : 76.1. Le Ray. Note sur la régénération artificielle et les méthodes d'enrichissement de la forêt dense en Okoumé. **[Note on the artificial regeneration and methods of improvement of dense *Aucoumea klaineana* forest.]** *Bois For. Trop.* 4 (4), 1948 (31–40). [F.]

The author first reviews the silvicultural characters of *Aucoumea klaineana* and then gives an account of experiments in artificial regeneration of this species in Gabon in order to enrich the existing forest by various forms of line or strip sowing and by clear felling and planting. The advantages of the former method are the partial maintenance of existing forest, no need of a nursery, more rapid achievement of closed canopy; the disadvantages are the heavy consumption of seed and limitation of operations to the season of abundant seed production (end of Dec. to beginning of Feb.). The advantages of planting are reduced consumption of seed and hence the possibility of operations every year, easier maintenance and supervision, smaller and more regular employment of man-power. Planting, however, is possible only in the month from mid-March to mid-April. Strip or line sowing uses up 15–20 times as much seed as planting, which is an important consideration, since Okoumé appears not to produce abundant seed every year. The great importance of proper tending and maintenance in either case is emphasized. The costs of each method per ha. treated are analysed.

23.22. Preparatory Work. Auxiliary Measures

See also *For. Abstr.* 10 (Nos. 190, 196).

[192]. 23.22.1 : 12.25 (942) : 11.49.5. CASSON, P. B. **Some observations on mound ploughing in the establishment of Radiata Pine.** *Aust. For.* 11, 1947 (40–3).

Establishment of *Pinus radiata* in South Australia is difficult on badly drained sites where there is often waterlogging, and ploughing is now used to prepare such sites. Lines are ploughed with a heavy disc plough towed by a crawler tractor, the trees being planted on top of the overturned soil. Furrows run across the contours so as to provide maximum run-off. If the site is very low-lying, a second plough line is run in the opposite direction, a few feet from the first, thus turning the second lot of soil on top of the first, increasing the height of planting, and providing drainage in a furrow on either side. The two processes are known as line ploughing (single operation) and mound ploughing (double operation). Planting is carried out along the top of the ridge and spot cultivation is unnecessary. After heavy rains, surplus water may have to be assisted from the furrows into the natural drainage system by digging through mounds at the point of collection. Line ploughing has been found satisfactory on slightly undulating sites, particularly on savanna grasslands. The disadvantages are (1) that the soil may plough in the form of long turves which lie with an air space beneath them, which necessitates digging at each planting site during planting operations; (2) that destruction of competition is not complete. Mound ploughing disturbs the ground more thoroughly, destroying more competing plants, and may be regarded as essential on very swampy sites. Measurements of some *P. radiata* on mound-ploughed (247 observations) and unploughed (238 observations) areas at 3 years gave percentage establishment 91·9 and 82·4, and mean height 53·8 and 22·4 in. respectively. The disadvantages of mound ploughing are expense, wear and tear on machines, dependence on fine weather for doing the work, and possibly future difficulty in logging.

[193]. 23.22.2 (436) : 34.2. LUSTIG, E. Zwischenkultur im Forst. **[Intercropping in the forest.]** *Allg. Forst- u. Holzw. Ztg.* 58 (7/8), 1947 (57–60). [G.]

Under present conditions in Austria there is some revival of interest in this practice, which is said to differ from the traditional forms of '*Waldfeldbau*' in that the interests of the forest crop and the forest soil are paramount and are kept in view the whole time. The combinations of crops and treatment are capable of manifold variation, according to site and the requirements of the agriculturist. A few practical examples are given in some detail, e.g. oats and rye sown almost simultaneously (the oats harvested in the same and the rye in the succeeding year), pumpkin and sunflowers, and the raising of stocks for fruit trees. Other possibilities are intercultivation with ornamental trees and shrubs or with medicinal plants, e.g. Belladonna. In all such combinations the treatment is determined by the co-existence on the same site of the young forest crop. The yields of the temporary crops are often considerably higher than those obtained on ordinary agricultural land.

[194]. 23.22.2 (436) : 34.2. HARTMANN, F. Der Waldgetreidebau als zusätzliche Ernährungsquelle. **[Intercropping with cereals in the forest as a supplementary source of food.]** *Allg. Forst- u. Holzw. Ztg.* 57 (3/4), 1946 (17–20). 2 refs. [G.]

It is claimed that intercropping with cereals during the regeneration of forest stands (1) has no adverse effect on the nutrient régime of good, fertile forest soils; (2) improves soil climate and biological activity, and creates a favourable environment for the young forest plants; (3) offers considerable protection against weevil attack [cf. *For. Abstr.* 10 (No. 734)]; (4) provides food for game and thus eases browsing on the young trees; (5) provides straw and thus gives less excuse for removal of forest litter; (6) gives supplementary employment to forest workers; and (7) is desirable in the present food emergency.

Suitable sites are clear-felled areas (1) which are not heavily overgrown with grass, *Vaccinium* spp. or heather; (2) having a gradient not too steep for reaping; (3) with fresh soils whose water supply will not be endangered; (4) where the type and fertility of the soil are such that no fertilizer will be necessary and no competition will occur with the forest crop for nutrients; (5) where the snow does not lie too long into the spring; (6) where deer and domestic animals constitute no serious threat.

In general, mild humus or mull soils, especially brown forest soils, are suitable. All dry soils, acid red-brown soils, dry podzol types and acid, wet peaty types, should be avoided.

Some notes are included on the technique of intercropping. [Cf. also *For. Abstr.* 10 (Nos. 196, 232).]

23.23. Seed and Sowings

[195]. 23.23 : 02.1 (492). Boomzaden: handleiding inzake het oogsten, behandelen, bewaren en uitzaaien van boomzaden. **[Tree seed: a guide to seed collection, treatment, storage and sowing.]** Nederlandsche Boschbouw Vereeniging. (Printed by Ponsen and Looijen, Wageningen). 1946. pp. 171. Numerous refs. [Du.]

This book, produced by a special committee of nurserymen and foresters appointed by the Nederlandsche Boschbouwvereeniging, is intended as a practical guide to species grown in Holland, and brings together much information previously available only as scattered papers.

An introductory chapter deals in general terms with topics such as provenance, climatic races, cross-pollination and hybridization, season of collection, storage and treatment of seed, and germination tests.

This is followed by the individual species, including some shrubs, alphabetically arranged (conifers and hardwoods separately). Under each species the data given, where available, include:—(1) Time and methods of seed collection; seed weight and seeds per unit weight; seed years. (2) Time and methods of storage and treatment in the period between collection and sowing; germination %; longevity. (3) Time and methods of sowing in the nursery. (4) The same for direct sowing. (5) Any other information. (6) References to literature.

[196]. 23.23 : 12.26–8 (410) : 23.22 : 76. Bourne, R. **Cultivation of Oak in 1948 or 1949.** *Quart. J. For.* 42 (2), 1948 (81–3).

The likelihood of an abundant acorn mast in Britain in 1948 or 1949 makes possible an extensive cultivation of Oak from seed. The author calculates that, with spacings of 5 ft. or less, it costs £40 per acre (£80 at compound interest after 25 years) to clear, fence and establish conifers, whereas raising Oak from seed should rarely exceed £10 per acre. Natural regeneration or sowings of Oak usually results in thickets with 14,000 or more saplings per acre after 10 years, numbers which permit of substantial and profitable early returns, and at 25 years of age Oak crops are worth £40 and more per acre.

Before sowing, the number of rabbits must be reduced, and the surface soil thoroughly worked. Sowing density is about 6 in. apart in rows 3 ft. apart. Weight of seed per acre varies from 2 cwt. of Pedunculate to 1 cwt. of Sessile Oak. In some cases complete ploughing of the area could be followed by a sowing of spring oats with acorns. The oats check weed-growth, generally leaving sturdy seedlings in a high stubble.

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 10 (Nos. 70, 760).

[197]. 23.23.1 : 12.25. Roe, E. I. **Balsam Fir seed, its characteristics and germination.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 11, 1948. pp. 13. 11 refs.

Includes data on the yield and quality of seed, and effects of stratification and presoaking. It is recommended that seed should be autumn sown, and if this is not practicable it should be stratified for about 6 months in moist sand at a temperature of 41° F. It should be sown in drills or broadcast to give 60–80 seedlings per sq. ft. and covered with about ¼in. of nursery soil. In order to prevent damping off, beds should be treated, before sowing, with sulphuric acid or aluminium sulphate.

[198]. 23.23.11 : 12.11.3 (494). Richtlinien für die Ausscheidung von Samen-Erntebestanden Directives pour le choix de peuplements propres à la récolte des graines. **[Principles for the choice of stands for seed collection.]** *Merkblatt der Beratungsstelle für Waldsamenbeschaffung* (*Mémorandum de l'Office de renseignements et conseils pour l'obtention de graines forestières*) No. 9. [German version in *Suppl.* to *Schweiz. Z. Forstw.* 98, 1947 (40–43); French in *Schweiz. Z. Forstw.* 99, 1948 (153–6).]

Contains very brief notes on the general principles for selecting such stands and a tabular statement of the chief qualifications for seed trees of the chief Swiss species.

[199]. 23.23.12 (74). Wyman, D. **Seed collection dates of woody plants [at the**

Arnold Arboretum]. *Arnoldia* 7 (9), 1947 (53–6). E.B.

[200]. 23.23.13 : 07.7. **New tree seed extraction machine.** *Pulp Paper Mag. Can.* 49 (4), 1948 (106).

The Ontario Dept. of Lands and Forests has designed and built a portable, semi-automatic tree-seed extraction machine. It consists of a cone hopper from which closed cones are fed to a moving slatted conveyor and carried under banks of infra-red lamps which are adjustable for distance and hence for heat intensity. The heat from the lamps partly opens the cones, and the extracted seeds drop through the slats, away from possible injury by excessive heat. Midway through the machine, the cones are immersed in water, which closes the scales. Subsequent heating reopens the scales to a greater extent and a larger seed recovery is obtained. The machine is actuated by a $\frac{1}{4}$-h.p. motor geared down 36,000 to 1; the power consumption for the lamps is 20 kw. Tests have shown that the seeds can stand exposure for 6 hours to a temperature of 170° F. and the machine is designed for thermostatic control to maintain the temperature at that level. Passage through the machine takes 4 hours.

[201]. 23.23.15 : 23.23.19. THORNTON, N. C. **Importance of oxygen supply in secondary dormancy and its relation to the inhibiting mechanism regulating dormancy.** *Contr. Boyce Thompson Inst.* 13 (10) 1945 (487–500). 41 refs.

[202]. 23.23.15 : 12.26–8 : 44.3. HENDRIX, J. W., MATSUURA, M., and KIKUTA, K. **Treatment of Papaya seed.** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (106–7).

Seven seed protectants were tested under local greenhouse conditions in Hawaii for effectiveness in preventing damping-off of seedlings of *Carica papaya*. The results indicated a marked benefit from the use of Phygon, Dow 9–B, and Spergon, in that order. Zerlate showed a tendency to delay emergence and retard the growth of young seedlings.

[203]. 23.23.15 : 12.26–8 (569) : 23.23.19. GINDEL, I. Ricerche sui semi di specie forestali indigene ed introdotte in Palestine : primi risultati. **[Researches on forest tree seed of native and introduced species in Palestine: first results.]** Istituto di Selvicoltura dell'Università di Firenze. 1947. pp. 48. 38 refs. [It.it.]

Report of a study made at Rehovot Agricultural Experiment Station on germinative capacity and pre-treatment of seed of forest tree species suitable for reforestation in Palestine. The methods employed and results of tests are set out in detail. Results are given for the following species:—*Acer syriacum, Ailanthus glandulosa, Anagyris foetida, Arbutus andrachne, Brachychiton populneum, Calycotome villosa, Catalpa bignonioides, Celtis australis, Ceratonia siliqua, Cercis siliquastrum, Dodonaea viscosa, Elaeagnus angustifolia, Fraxinus syriaca, Genista sphacelata, Gleditsia triacanthos, Laurus nobilis, Melia azedarach, Parkinsonia aculeata, Phillyrea media, Pistacia atlantica, P. palaestina, P. lentiscus, Quercus infectoria, Q. ithaburensis, Q. calliprinos, Retama raetam, Rhamnus palaestina, Rhus coriaria, Robinia pseudoacacia, Sophora japonica, Styrax officinalis, Tetraclinis articulata, Zizyphus spina-christi.* The results are discussed.

The following treatments were tested:—soaking in plain water at room temperature, soaking in boiling water, soaking in H_2SO_4, scarification, and combinations of these. Soaking in plain water at room temperature had little effect on most species of seed, unless they had been scarified, in which case it proved very effective. Soaking in boiling water markedly accelerated germination of seeds of Leguminosae (e.g. *Robinia, Calycotome villosa*) and *Rhus*, but had a neutral or negative effect on seeds of *Pistacia* and *Zizyphus*. Scarification, properly carried out, improved the results of boiling-water treatment in respect both to time taken and percentage of germination. It was observed that complete removal of the testa (in the part scarified) so as to expose the endosperm, gave results inferior to those obtained by leaving a thin layer of the testa, which permits of more gradual penetration of the water.

Maximum acceleration was obtained by simultaneous use of two or three of the above mentioned methods, which resulted in germination after so many hours or days instead of weeks or months, e.g. *Zizyphus spina-christi* and *Parkinsonia aculeata* after 16 hours, *Ceratonia siliqua, Calycotome villosa, R. raetam* after 38–40 hours.

Optimum temperatures for germination of

Parkinsonia and *Zizyphus* were found to be 39° and 37° C. respectively.

Tests were also made with whole fruit and it was found that the presence of the pericarp generally retarded germination and diminished the percentage.

[204]. 23.23.15 : 12.26–8 : 12.25 (969). AKAMINE, E. K. **Germination and viability studies of forest tree seeds.** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (116–18).

A study was made on the germination and longevity of seed of 10 Hawaiian tree species. The only effective method of hastening the germination of seed of *Santalum album* is to remove the seed coat partially, or preferably wholly, by hand. Mechanical scarifiers or hot water are either ineffective or injurious, and sulphuric-acid treatment is definitely detrimental. Poor germination of this seed is caused by the mechanical restraint of the tough seed coat which prevents the embryo from expanding to its maximum imbibitional capacity.

The results of germination tests on seed of *Araucaria excelsa* stored under various conditions of temperature and humidity are detailed. Optimum storage conditions for increasing longevity appear to be a relative humidity of 60–75% at a temperature of about 7° C.

[205]. 23.23.15 : 12.25. WAKELEY, P. C. **Advances in storing Southern Pine seed.** *Sth. For. Note Sth. For. Exp. Sta.* No. 47, 1947 (1).

Seed of the principal southern Pine species can be stored for years at 5° F. without injury from cold and usually with better results than at 35–41° F., the temperatures hitherto recommended. If the air of the storage chamber is moist, the containers should be sealed, but if the relative humidity is low, results are equally good from open, sealed, or vacuum containers.

[206]. 23.23.15 : 12.26–8. BARTON, L. V. **Effect of different storage conditions on the germination of seeds of *Cinchona ledgeriana* Moens.** *Contr. Boyce Thompson Inst.* 15 (1), 1947 (1–10). 7 refs.

Seeds of *Cinchona ledgeriana* were stored to determine the effect of temperature, moisture content, light and gaseous exchange upon their keeping quality. Data are presented for periods up to and including 4 years of storage. *C. ledgeriana* seeds can be kept successfully for at least 4 years by maintaining a moisture content of below 9% of the dry weight of the seeds and a temperature between 5° C. and – 4° C. *From author's summary.*

[207]. 23.23.19 : 12.26–8. PAŞCOVSCHI, S. O experienţa de selecţionare a seminţelor. [**Experiment in the selection of forest seed.**] *An. Inst. Cerc. Exp. for., Bucureşti, 1944–5* 10, 1946 (249–53). [Rum.g.] P.R.

Experiments were made with Oak (*Quercus robur*) and Horse Chestnut (*Aesculus hippocastanum*). Acorns were divided into 4 classes according to size and shape, and the height of one-year seedlings was measured. The first 3 classes contained acorns of various size (129, 225, and 155 to the kg. respectively) which produced vigorous seedlings with average heights respectively 15·4, 15·2, and 14·6 cm. The fourth class contained very small acorns (330 to the kg.), which gave very weakly plants with an average height of only 11·5 cm. It is concluded that such small acorns ought not to be used in forest operations.

The Horse Chestnuts were divided into two classes. The first, containing large seeds (60 to the kg.) produced seedlings averaging 14·7 cm. height. The second with 116 to the kg. produced seedlings of only 11·8 cm., but the same diameter as the first class and apparently equally vigorous.

23.23.3. *Methods of Sowing*

See also *For. Abstr.* 10 (No. 139).

[208]. 23.23.3 : 12.25 (78) : 76. SCHOPMEYER, C. S., and HELMERS, A. E. **Seeding as a means of reforestation in the Northern Rocky Mountain region.** *Circ. U.S. Dep. Agric.* No. 772, 1947. pp. 31. 31 refs.

Report on experiments initiated in 1937. Western White Pine [*Pinus monticola*] was successfully spot-sown on freshly-burned, north-facing slopes and flats within the White Pine type, when protection against rodents was provided in the form of conical wire screens (left for 1 year) or poisoned bait. The number of seedlings thus established compared favourably with those established by planting. Autumn sowing of *P. monticola*, *Picea engelmanni*, and *Thuja plicata* resulted in better initial stocking than spring sowing. Cultivation of seed spots at the time of sowing on burned-over areas did not improve the germination or survival of *Pinus monticola*, *P. ponderosa*,

and *Picea engelmanni*. Broadcast sowing of *P. monticola* achieved higher stocking than spot sowing, but is of doubtful value, since it required almost 4 times as much seed. Reforestation by the screened-spot method on lightly vegetated, deforested areas in the Ponderosa Pine type, resulted in greater early establishment than did planting of nursery stock.

Satisfactory stocking of *Thuja plicata* was obtained without protection of the seeds from rodents, but growth was very slow for the first 5 years.

Picea engelmanni showed better stocking when seeds were protected from rodents, but on the whole direct sowing is less promising for this species than for the Pines.

The total cost for direct spot sowing of either *P. ponderosa* or *P. monticola* averaged about two-thirds of that for planting 2–2 nursery stock such as is generally used in this region, and about the same as that of planting 2–0 nursery seedlings. The costs of direct sowing of *Thuja plicata* and *Picea engelmanni* were substantially lower than for planting 2–2 nursery stock. *From authors' summary.*

[209]. 23.23.3 : 23.6 : 12.25. HELMERS, A. E. **Early results from thinning seed spots.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 58, 1948. pp. 5.

Experiments showed that although number of seedlings per seed spot had little effect on height growth it had a pronounced effect on diameter growth of 9-year-old Engelmann Spruce, Ponderosa Pine and Western White Pine seedlings originating from direct sowing. *From author's summary.*

[210]. 23.23.3 : 12.25 : 45.12 : 13.2 : 23.23.15. **Direct seeding on recent burns in Ponderosa Pine.** *Rep. Sthwest. For. Range Exp. Sta.* 1947 (51–3).

A small-scale experiment in spot sowing of Ponderosa Pine on recently burnt areas showed that where protection against rodents was provided, initial survival was fairly good, but that on unscreened sites the seeds were eaten even before germination. Although the seed used in the study had been collected 10–11 years previously and stored in loose-lid tins under the roof of an open garage where it had been subjected to temperatures ranging from – 20° to 90° F., it displayed a germinative capacity of 75–80%.

[211]. 23.23.3 : 12.26–8. **[Methods of sowing *Acacia mollissima*.]** *Rep. For. Dep. Tanganyika 1945*, 1948 (20).

A comparison of the effects of line sowings of Black Wattle in wetter areas at Kasulu showed that 'ridged and tie-ridged' rows gave a height growth of 3 ft. (one tree was 8 ft. 6 in.) while, in the strip-cultivated section on the flat, height growth averaged 5 in. Very poor results were obtained from spot sowing.

23.24. Formation of Stands by Planting

[212]. 23.24 (713) : 21.0. **Forest tree planting.** *Bull. Ont. Dep. Lds. For.* No. R1 (rev.), 1947. pp. 68.

A revision of the bulletin noticed in *For. Abstr.* 2 (211).

[213]. 23.24 (766) : 24.4 : 11.62.11. AFANASIEV, M. **Trees and tree planting for posts, windbreaks and erosion control [in Oklahoma].** *Bull. Okla. agric. Exp. Sta.* No. B–314, 1947. pp. 22.

[214]. 23.24 (766) : 21.64. AFANASIEV, M. **A preliminary study of tree plantations in Oklahoma: relative survival by species, and factors affecting survival.** *Tech. Bull. Okla. agric. Exp. Sta.* No. T–29, 1948. pp. 27.

Analyses the causes of failure and poor growth. A background study to Bulletin B–314 [see preceding entry].

[215]. 23.24 (77 : 75) : 97.2. MINCKLER, L. S., and CHAPMAN, A. G. **Tree planting in the Central, Piedmont, and Southern Appalachian regions.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1994, 1948. pp. 40. 7 refs.

[216]. 23.24 : 12.26–8 (436) : 23.26 : 24 : 44.1. PESCHAUT, R. Die Kultur und Pflege der Kanada- und Robustapappel in den Donauauen. **[The cultivation and tending of 'Canadian' and Robusta Poplars in the Danube bottomlands.]** *Allg. Forst- u. Holzw. Ztg.* 58 (17/18), 1947 (139–41). [G.]

Goldenrod [*Solidago* sp.] is a pest in this region, preventing regeneration even of the Salicaceae, whether by seed or by coppice and suckers. Control by other than silvicultural means is uneconomical, and for the time being at least, the answer is artificial regeneration of felled areas and of gaps (e.g. those caused by Elm disease) with rapid growing trees, of which

the Poplars named are the most successful as pioneers. White Willow [*Salix alba*] may also be used. In many places it will be necessary to suppress the goldenrod by planting at 5 × 5 m., thinning after several years to 10 × 10 m. and bringing in auxiliary species such as Lime, Ash and Maple.

Notes are made on the lifting, root and shoot pruning, and storage of planting stock, preparation of planting holes, protection, and pruning.

It is envisaged that 1/0 stock will be used, except for gaps in stands and for beating up, where 2/0 stock is desirable. The latter should be root-pruned *in situ* after its first growing season in the nursery, preferably at the end of February. Root pruning of 1/0 stock is kept to what is essential, having regard to the size of planting holes. All lateral branches are pruned back before planting.

Planting holes, prepared in autumn, should be 50 × 50 × 50 cm., and round them all weeds should be removed for a radius of 1 m., or if goldenrod is present, 1·5 m., the goldenrod stems being spread on the ground (thus preventing damage to the Poplars by 'laying' of the goldenrod and helping to suppress regrowth of this weed). If the groundwater level is high, mound planting should be done or *Salix alba* planted. One-year-old plants should be set about a hand's breadth and 2-year-old plants about 20 cm. deeper than they stood in the nursery. If periodical flooding with running water is likely, the plants should be staked.

Protection against deer, hare and rabbits is afforded by thorny branches wired round the Poplars. Mouse damage cannot be prevented. Branches with canker should be cut off and burnt; plants affected by bark-burn [*Dothichiza populea*?] should be cut back to about 20 cm. above ground level, the stump serving as a stake for the new shoot until the latter is strong enough, when the stump can be cut right back. In the year of planting, the goldenrod must be kept down and the ground should be hoed. Later *Clematis* and *Humulus* may need to be cut back.

In closed stands no green pruning should be necessary. Where, under more open conditions, green pruning is necessary, it is recommended that the length of crown in relation to the clear bole should be as 7 : 3 for trees 10 m. high, 10 : 10 for those 20 m. high, and 33 : 66 for those 25 m. high. [Cf. *For. Abstr.* 10 (Nos. 49, 135, 146, 225–6).]

23.24.2. *Methods of Planting*

See also *For. Abstr.* 10 (No. 235).

[217]. 23.24.2 : 07.7. POWELL, G. M. **A tree planting spade for a crawler tractor.** *J. For.* 46 (4), 1948 (278–81).

Description of a device which has planted more than one million trees in New York State in the last 2 years. It consists of digging spades attached to the treads of a standard crawler-type tractor. Spacing up to 6½ ft. can be obtained. When working properly, the spade will lift the sod and place it upside down beside the hole. The planter places a tree in the hole, tips the sod into place, and treads it in. From 20,000 to 30,000 trees can be planted during an 8-hour day with the use of one tractor and 10–14 planters.

23.24.3. *Spacing*

See also *For. Abstr.* 10 (Nos. 166, 241).

[218]. 23.24.3 : 12.25 (761) : 56 : 24.25 : 76. WARE, L. M., and STAHELIN, R. **Growth of Southern Pine plantations at various spacings.** *J. For.* 46 (4), 1948 (267–74). 3 refs.

An experiment was started at the Alabama Agricultural Experiment Station in 1932 to study the influence of spacing and time of later thinnings on the yield of Slash, Longleaf, and Loblolly Pine plantations on abandoned fields. The spacings were 4 × 4, 6 × 6, 6 × 8, 8 × 8, 10 × 10, 12 × 12, and 16 × 16 ft. Measurements at the end of 14 growing seasons lead to the following conclusions:—Spacing had no important influence on height growth of dominants. Spacings of 6 × 6 to 8 × 8 ft. with good survival, and a spacing of 10 × 10 ft. with 90% survival will furnish sufficient vigorous trees for a good final yield. Plantations with initial spacing 6 × 6 ft., thinned at 12 years to 500 per acre, left a stand equal in quantity and far superior in quality to unthinned 8 × 8 or 10 × 10 plantations. With a good pulpwood market, the fact that thinnings yield more and can be made earlier with 6 × 6 than with 6 × 8, 8 × 8 or 10 × 10 spacings leads to early overcrowding, slower individual growth and suppression of many stems before they reach marketable size. Spacings wider than 10 × 10 give too few desirable crop trees and

insufficient use of the growing space for at least the first 14 years; the greater speed with which individual trees reach sawlog size is offset by the low quality of the lumber and the absence of early returns from thinnings. Crowding retards and wide spacing stimulates both diameter and volume growth of Loblolly Pine more than of Slash Pine. Longleaf Pine should apparently always be planted closer than Slash and Loblolly because of its different growth habits and frequently lower survival. *From authors' summary.*

23.26. Plant Rearing. Nursery Practice

See also *For. Abstr.* 10 (Nos. 174, 195, 197, 202, 235, 665, 689, 701-2).

[219]. 23.26 (494). Pflanzgarten (Anlage und Berechnung der Grösse). La pépinière (Établissement et calcul de la grandeur). **[Nurseries: [simple directions for] establishment and calculation of size.]** *Merkblatt der Beratungsstelle für Waldsamenbeschaffung (Mémorandum de l'Office de renseignements et conseils pour l'obtention de graines forestières)*, No. 10. In *Schweiz. Z. Forstw.* 99 (3), 1948 (156–60). [G.F.]

[220]. 23.26 : 07.7. M[ACDONALD], J. A. B. **Improvements in practice: mechanisation and the nursery.** *Scot. For.* 1 (3/4), 1948 (14–18).

A review of possibilities of mechanization in cultivation, seedbed preparation, sowing, lining out (including an account of the successful use of a Robot cabbage planter), weeding and lifting seedlings and transplants.

[221]. 23.26 : 07.7. ADDISON, P. **Mechanization in nurseries [descriptions of machines for sowing, lifting and transplanting].** *Sylva, Toronto* 4 (2), 1948 (33–40).

[222]. 23.26 : 11.42. JACOBI, E. T. Grondonderzoek en boomkweekerij. **[Soil research and arboriculture.]** *Tijdschrift der Nederlandsche Heidemaatschappij* 58 (4), 1947 (119–23). [Du.] H.S.B.

Gives sample analyses of soils from 5 nurseries and discusses their probable effect on growth of young trees.

[223]. 23.26 : 12.25 : 12.11.3 : 01.7. LIDDICOET, A. R., and KIMBROUGH, E. F. ***Pinus*: propagation of experimental stock** *For. Res. Notes Calif. For. Range Exp. Sta.* No. 56, 1947. pp. 8.

Account of nursery practice at the Institute of Forest Genetics, Placerville, for raising experimental stock of Pine for the tree-breeding programme. The technique described was devised with the requirements of statistical testing in mind. It permits the use of a simple system of marking the rows and lines of seedlings in a bed so that pedigree and individual performance records may easily be kept.

[224]. 23.26 : 23.23 : 44.3 : 45. **Analysis of seed-bed losses.** *Rep. N.Y. St. Conserv. Dep. 1942*, 1943 (106).

Beds of White Pine, Red Pine, Larch, Cedar, and Hemlock, were sown in the autumn, using accurately weighed amounts of seed for which the number of seeds per lb. and germination percentages were known: seedling counts and observations were made as soon as germination appeared to be complete. Based on the 'potential' number of seedlings which could have been produced under optimum conditions, the number of live seedlings ranged from 24 to 60%, dead seedlings 2 to 17%, and the 'unaccounted for' 16 to 66%. In the case of dead seedlings which were found, mortality was due principally to damping off, tops destroyed by birds, cutworms or wind abrasion, and germination on the surface of the ground.

[225]. 23.26 : 12.26–8 (436) : 12.11.22. PESCHAUT, R. Die Nachzucht der Kanada- und Robustapappel im Pflanzgarten. **[Nursery practice for 'Canadian' and Robusta Poplars.]** *Allg. Forst- u. Holzw. Ztg.* 58 (11/12), 1947 (92–4). [G.]

Practical notes, on conventional lines, on the nursery area required, soil cultivation, stool beds and the preparation and planting of cuttings. It is emphasized that Poplar beds require a change of crop every year, in addition to fertilizer. This is secured by using alternate halves of the area in alternate years for raising vegetables. [Cf. *For. Abstr.* 10 (Nos. 49, 135, 216).]

[226]. 23.26 : 12.26–8 : 12.11.22 : 23.24.3. RADULESCU, A. V. Cercetări privind distanțele de sădire în pepinieră a butașilor de plopi de Canada. **[Studies in the spacing of 'Canadian' Poplar cuttings in nurseries.]** *Rev. Pădurilor* 63 (1), 1948 (1–4). [Rum.f.]

As a result of experiments in nursery planting of Poplar cuttings, the author concludes that the optimum spacing is 30 cm. between cuttings in a row and 40 cm. between rows. The results of the experimental plantings are given in tables.

[227]. 23.26.3 : 12.14.3 : 12.26–8. BUSHEY, D. J. **Regeneration of the root systems of Pin Oak (*Quercus palustris*) and American Elm (*Ulmus americana*) following transplanting in the fall and spring.** (With discussion.) *Proc. 22nd nat. Shade Tree Conf.* 1946 (46–56).

[228]. 23.26.4 : 11.47.12. WILDE, S. A., BRENER, W. H., and KRUMM, C. J. **Types of composted fertilizer used in forest nurseries.** *Proc. Soil Sci. Soc. Amer. 1946* No. 11, 1947 (508–10). 5 refs. L.S.

Suggests and defines terms for the types of composted fertilizer used in nurseries: (1) fermented composts, prepared from organic matter which undergoes rapid and nearly complete decomposition and contains nutrients largely in biologically fixed form; (2) partly activated composts, made from a mixture of decomposable and decay-resistant organic remains which retain released or added mineral salts; and (3) inert composts, prepared from decay-resistant organic matter (chiefly peat). Discusses the relative advantages of each group, and describes and tabulates the results of greenhouse trials, showing the effect of each on the growth of Black Locust [*Robinia pseudoacacia*] and concluding that, from both nutritional and financial aspects, partly activated composts are most suitable.

[229]. 23.26.4 : 12.25 : 23.24.1 : 11.43.1. RAYNER, M. C. **Behaviour of Corsican Pine stock following different nursery treatments.** *Forestry* 21 (2), 1947 (204–16 + plate). 7 refs.

Describes an experiment to compare the survival and growth of 2-year-old Corsican Pine (*Pinus nigra* var. *calabrica*) transplants of different nursery origin on poor heathland and in an exposed position. Plants of 3 different origins were used:—(1) Raised in the same poor heath soil with addition of compost; lined out for 1 year in similar soil with addition of compost. (2) Raised by 'standard nursery methods'; lined out for 1 year in the same nursery. (3) Raised as in (1); lined out for 1 year as in (2). The plantings were duplicated in each group, one series being supplied with phosphates (basic slag) at planting. All treatments were quadruplicated in randomized plots.

Plants of origin (1) were greatly superior to those of (2). The death rate of the latter was very heavy, and was increased by a supply of phosphate at planting. Those of (3) occupied a median position. Phosphate at planting helped growth in all series. The root systems of plants raised in heath soil with compost were well supplied with short roots and mycorrhiza at planting and throughout growth. Those of the nursery transplants were very deficient in short roots and devoid of mycorrhiza.

The experiment illustrates the fact that seedlings of Corsican Pine, raised in soil conditions ensuring possession of a normal root system with adequate mycorrhizal equipment, carry their constitutional vigour into the forest and even to poor soils of non-forest type. The significance of this for treating soils in tree nurseries generally, is discussed. *From author's summary.*

23.27. Arboriculture

See also *For. Abstr.* 10 (Nos. 85, 694, 840).

[230]. 23.27 (410) : 21. COLVIN, B. **Trees for town and country—a selection of sixty trees suitable for general cultivation in England—prepared for the Association for Planning and Regional Reconstruction.** Percy Lund, Humphries & Co., Ltd., London. 1947. pp. 132. 8 refs. Price 25*s*.

Descriptions, with photographs and line drawings, of species suitable for decorative and protective planting in Britain. Brief notes on natural habitat, soil and climatic requirements and methods of planting or sowing, are included.

23.3. *Afforestation*

See also *For. Abstr.* 10 (Nos. 139, 812–5).

[231]. 23.3 (411–4) : 11.49.5. **Studies of certain Scottish moorlands in relation to tree growth.** *Bull. For. Comm., Lond.* No. 15, 1933 (repr. 1947). pp. 112.

[232]. 23.3 (437) : 11.48.2 : 23.21 : 23.22.2 : 11.62.11. KANÁK, J. K problému zalesnovania piesčin. **[The problem of afforesting**

sands.] *Pol'ana* 3 (1/2), 1947 (16–18). [Slovak.e.f.]

The 'Velky Bor' is a unique area of diluvial infertile sand along the dry N.W. foothills of the Little Carpathians, N. of Zohor, which was successfully fixed by afforestation with Pine some 350 years ago. Subsequently many forest clearings were made—the larger ones for rifle ranges—and their continual spread despite all efforts at regeneration by the forest authorities since World War I, is causing much concern. Shelterwood and strip methods of regeneration, even where assisted by artificial sowings, have all failed. The author recommends a reversion to the former practice of complete tillage, involving the removal of all stumps (the breeding foci of insect pests), thorough mixing of the litter and soil, and temporary cropping with rye and millet. To effect this, the author urges the introduction of machine cultivators, to supplement human and animal labour which is becoming increasingly short; as clearings average 400–450 ha. and total 28,000 ha. in all, machine working is a practical proposition. He also pleads for the introduction of hardwoods, particularly Oak, into the Pine; scattered Oak and grasses, tradition asserts, preceded the Pine in this sandy area, and despite long neglect, Oak persists and regenerates in many places, even where Pine has failed and it is in just such areas that insect epidemics on the Pine have been checked. 'Canadian' Poplars have already failed, except in the vicinity of running water, but the success of Robinia on sandy wastes in Hungary might well be repeated in the 'Velky Bor'.

[233]. 23.3 (44) : 23.21 : 12.11.3. GUINIER, P. Les essences de boisement dans les Vosges. [**Species for afforestation in the Vosges.**] *Bull. Com. For., Paris* 12 (80), 1947 (948–55). [F.]

[234]. 23.3 (548) : 12.26–8 : 21.0. **Irrigated Casuarina plantation.** *Rep. For. Adm. Mysore 1942*, 1947 (14–15).

A one-acre irrigated plantation of *Casuarina equisetifolia* gave good results. In 20 months the plants are reported to have attained a height of 30 ft. and girth of 18 in. Further experiments with this species, *Dalbergia sissoo* and Eucalypts were in hand.

[235]. 23.3 (569) : 11.62.11 : 23.21 : 12.26–8 : 23.24.2 : 23.26 : 23.25. GOOR, A. Y. **Sand dune fixation in Palestine.** *App. I* to *Rep. Palest. Dep. For.* 1947. pp. 8 + 11 photos, 1 gph.

Records briefly the progress made in dune fixation in Palestine during the past 30 years. An account is given of the methods successfully employed for planting *Acacia cyanophylla* directly in bare sand without prior fixation of the sand by grasses etc. Large plants (80–120 cm. high) are used and are planted 40–60 cm. below and 40–60 cm. above ground, with a shallow depression round the plant. This usually suffices to prevent the plants being either covered or uncovered completely by moving sand. Another experiment was made in planting *Tamarix articulata* and *T. pseudopallasi* directly on moving dunes at different seasons of the year. Large cuttings were set deeply in the sand, inclined away from the prevailing wind. This experiment showed that *Tamarix* is extremely resistant to burying or exposure by moving sand and that it will grow even if planted at the height of summer.

Eucalyptus camaldulensis is still being planted on a small scale, usually in areas where there is some soil. It grows very slowly and where planted with *Acacia* soon suffers from competition. Where it has been cut, it has coppiced well. *Pinus halepensis* has been a failure; trees 20 years old are still only miserable bushes. *P. pinea* shows more promise, as there are signs that direct sowing in fixed areas may be successful. *Dalbergia sissoo* needs protection from drought and wind, but does well once it is started. *Populus* spp. (both *alba* and *nigra*) do well, especially on the banks of moving dunes.

Nursery technique with *A. cyanophylla* has now been standardized. The seed is soaked in boiling water for some hours and then sown in early summer in fine soil in halved petrol tins. When 2–4 cm. high the seedlings are transplanted into pots and placed in an irrigated bed where they stay till the following February, when they are about 1 m. high and ready for planting out. The growth of a taproot is discouraged by the pot, but as the plant usually sends a root through the hole in its base, root cutting is done twice during the summer.

[236]. 23.3 (66 : 67) : 12.26–8 : 43.11. CHEVALIER, A. L'arbre à benjoin du Tonkin et son emploi en Afrique occidentale comme arbre de reboisement et pare-feu. [***Styrax tonkinensis* and its use in West Africa for**

afforestation and as a fire-break.] *Rev. int. Bot. appl. Agric. trop.* 27 (297/8), 1947 (309–10). [F.] P.R.

[237]. 23.3 (747) : 21.0 : 12.25. Cook, D. B., and Schierbaum, D. L. **Planting an adverse site in New York.** *J. For.* 46 (5), 1948 (377).

Experiments were made with Red and Jack Pine, White Spruce, White Cedar, European and Japanese Larch, for the afforestation of abandoned, hill-top farmland in New York State, with poor soil and severe climate. Japanese Larch proved to be best, showing high survival, firmness against frost-heaving and superior height growth. At 7 years it had already begun to establish forest conditions.

[238]. 23.3 (82) : 97.2 : 82. Lucioni, P. El problema forestal argentino. La plantación de especies maderables para las necesidades de la chacra. **[The Argentine forest problem. Planting timber species for farm requirements.]** *Montes, Madrid* 3 (18), 1947 (554–6). [Span.]

The author recommends useful species for planting round 'chacras', small, isolated farms in Argentina, and discusses a suggestion for forming an Argentine forest labour corps on the Norwegian pattern.

24. TENDING OF STANDS AND TREES

See also *For. Abstr.* 10 (No. 216).

[239]. 24 (944). Clarke, B. **Instructions for T.S.I. operations in the Coff's Harbour district.** *N.S.W. For. Rec.* 1 (1), 1948 (23–6).

Notes prepared for the guidance of officers in the Coff's Harbour district of New South Wales, for the carrying out of timber stand improvement operations.

24.2. *Thinnings*

See also *For. Abstr.* 10 (Nos. 170, 218, 271).

[240]. 24.2 (438) : 94.11. Zarzadzenie Dyrekcji Naczelnej Lasów Państw. w sprawie trzebieży. **[Instructions on thinnings of the Polish State Forests.]** Drukarnia św. Wojciecha, Poznań. 1934 (repr. 1945). [Pol.]

A reprint of the 1934 instructions issued by the State Forest Administration, which inaugurated a campaign of heavier thinnings in State forests.

[241]. 24.2 : 12.25 (68) : 24.5 : 23.24.3 : 56 : 76. Hiley, W. E. **Craib's thinning prescriptions for conifers in South Africa.** *Quart. J. For.* 42 (1), 1948 (5–19). 7 refs.

The writer discusses in detail Craib's methods of spacing and thinning [cf. *For. Abstr.* 1 (165); 9 (No. 816)], officially adopted in the management of the exotic Pine plantations of the Union of S. Africa. He gives some account of the impressions he gained in the course of a tour in S. Africa and presents a table to show the effect of thinning Douglas Fir in Great Britain to correspond to Craib's prescription for *Pinus patula* at corresponding heights. The outstanding features of the system are the method of calculating planting and thinning from the statistical results of growth studies, and the earliness and heaviness of the thinning. The author's main criticism is that there is as yet insufficient evidence for confidence in the results. For slower growing trees, Craib assumes rotations of 40–50 years, but there are no plantations of that age in the country, with the exception of *P. radiata.* He has, consequently, had to work with curves extended far beyond the points given by actual readings and, in some cases, his methods of extrapolation appear to be of doubtful soundness. Another point to be borne in mind is that in the financial calculations on which these prescriptions are based, the value of thinnings has been assessed at a very low figure. In British forestry, thinnings are a very valuable commercial asset and they cannot be dismissed in this manner. Finally, it is urged that experiments in this method should be initiated in Britain with modifications suitable to the very different economic and environmental conditions.

[242]. 24.22 : 22.83.1 : 56. Holsoe, T. **The relation of tree development to the timing of the first thinning in even-aged hardwood stands.** *Harv. For. Pap.* 1 (2), 1947 (20–5). 5 refs.

The measurements on which this study is based were taken from 120 Red Oak (*Quercus borealis* var. *maxima*) and 99 White Ash (*Fraxinus americana*) in mixed second-growth stands. The data are analysed in a series of graphs and discussed in some detail. The following conclusions are drawn:—(1) There is a definite relationship between the different dimensional increments of the tree; when crown diameter and crown length increase, the rate of

increment of d.b.h. will also increase. (2) Total height is a better criterion than age for the different dimensional increments of the tree. (3) height increment begins to slow down at the time when the crown form changes from a pointed to a dome-like shape. (4) The first thinning should be made when this change takes place.

24.4. *Shelterbelts. Windbreaks*

See also *For. Abstr.* 10 (Nos. 139, 213–4, 695).

[243]. 24.4 (788). PRESTON, R. J., and BRANDON, J. F. **Thirty-seven years of windbreak planting at Akron, Colorado.** *Bull. Colo. agric. Exp. Sta.* No. 492, 1946. pp. 21 + 2 tbls.

A fairly detailed report on windbreaks planted in 1909, 1910, 1912, 1935 and 1936, with notes on individual species. The most effective and durable windbreak was composed of Pines. Ponderosa Pine after 36 years continues to make good growth and appears to be healthy and vigorous; Austrian Pine is only slightly inferior. Lodgepole, Limber and Pinyon Pines show promise, though the two latter are difficult to establish. The experiments indicate that a good all-purpose windbreak for north-eastern Colorado would consist of 2–6 interior rows of Ponderosa Pine with a marginal row on each side of *Juniperus scopulorum*. As these trees grow slowly during early years, a short-lived, fast-growing broad-leaved species such as Hackberry [*Celtis* sp.] or American Elm could be planted on the windward side and removed as the evergreens attain the requisite size.

24.5. *Pruning*

See also *For. Abstr.* 10 (Nos. 216, 241, 662).

[244]. 24.51 : 12.25 : 44.3 : 12:21. **Pruning in relation to diseases of Ponderosa Pine.** *Rep. Sthwest. For. Range Exp. Sta.* 1947 (54–5).

Report on a preliminary study of what diseases, if any, attack Ponderosa Pine through pruning wounds. Nine sample plots were laid out in even-aged pole stands pruned 7–13 years ago. The plots contained 3,310 trees, of which 932 had been pruned. All pruning wounds were examined from the ground, and about 10% of pruned trees felled and split so that each knot could be opened up and critically examined. Altogether, 15,000 pruning wounds were observed from the ground, and 1,579 knots studied intensively. Only one fungus was found that appeared able to enter trees directly through pruning wounds. This was the canker-forming and staining fungus *Atropellis piniphila*, which normally enters through dead branches. The condition of the branch at the time of pruning (whether green or dead) did not appear to influence the entrance of the fungus.

Of probably greater importance is the effect of pruning on the development of the western red rot (*Polyporus anceps*) which is responsible for over 55% of all defects of Ponderosa Pine in the south-western United States. This fungus enters the stem through dead branches, and previous studies showed that the likelihood of infection was directly related to the size of the branches. The pruning study confirmed earlier evidence that *P. anceps* is unable to attack through pruning wounds or through sound dead branches on which the bark has become loose or sloughed off. It further indicated that pruning may in some cases retard and even kill the fungus after it has become established in the knot.

[245]. 24.51 : 12.25 : 31.8. OLSEN, D., and PAUL, B. H. **Some results of artificial pruning of Ponderosa Pine.** *W. Cst. Lumberm.* 75 (5), 1948 (94–6, 104).

A study of the effects of pruning on timber quality in Ponderosa Pine. In 1925 the dominant trees in a Ponderosa Pine stand, planted in 1912, were selected for pruning. A second pruning of the entire plantation took place in 1937. In 1947 sample logs were removed for examination. The results are described and some practical recommendations for pruning are made. Early pruning facilitates the production of clear timber at an early age, and clear timber is produced much more quickly if the trees are pruned while making rapid growth. A thinning at the time of pruning will help to accelerate diameter growth in the remaining trees. Smoothly cut branches heal over much more quickly than jagged ones. In seasoning, boards from the unpruned trees warped considerably because of irregular and distorted grain close to the unpruned branches. The economic aspect is briefly discussed.

3. FOREST UTILIZATION. FOREST TECHNOLOGY

See also *For. Abstr.* 10 (Nos. 17, 24–5, 28, 34).

[246]. 3 (729.88). CATER, J. **The forest industries of Trinidad and Tobago.** *Carib. For.* 9 (1), 1948 (1–13). [E.Span.f.]

[247]. 3 (795) : 07.2. DUNN, P. M. **Wood utilization research in Oregon—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (234–41).

An outline of the work of the Oregon Forest Products Laboratory, particularly in the field of waste-wood utilization, covering fibreboard construction, briquetting, production of wood alcohol, use of lignin, manufacture of corky material and extraction of gums and oils from Douglas Fir bark, recovery of pulpwood and other types of wood from logging waste and the discovery of uses for hitherto unused species.

[248]. 3 (931) : 07.2. **New Zealand State Forest Service (Branch of Forest Products): Programme of Work 1947–8.** Govt. Printer, Wellington. 1947. pp. 50.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

[249]. 31. PHILLIPS, E. W. J. **The biology and properties of wood.** *New Biology, London* No. 4, 1948 (74–98 + 8 photos). 7 refs. [Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks.] P.R.

[250]. 31 : 33 : 38.2. CAMPREDON, J. Le bois: matériau de la construction moderne. **[Wood, a modern constructional material.]** Dunod, 92 Rue Bonaparte, Paris 6e. 1946. pp. 153. 80 refs. [F.] P.R.

Contains chapters on: wood structure; physical and chemical properties; mechanical properties; wood and the strength of materials; seasoning and preservation; veneer, plywood and fibreboard; improved wood; new techniques in construction and engineering; bending and moulding and their application to aircraft construction.

31.0. *General Information on Woods*

See also *For. Abstr.* 10 (Nos. 116, 120, 136, 138, 143, 152).

[251]. 31.0 : 12.26–8. **Some new timbers and their uses.** *Timb. Inform. Timb. Developm. Ass., Lond.* No. 34 [1948]. pp. 8.

An annotated list of timbers imported under the Hardwood Overseas Procurement Scheme, Part III, during the last 12 months.

[252]. 31.0 (6) : 12.26–8. **African timbers.** *Timb. Inform. Timb. Developm. Ass., Lond.* No. 33 [1948]. pp. 2.

An annotated list of some of the newer African timbers imported under the Hardwood Overseas Procurement Scheme, Part III.

[253]. 31.0 (728.1). RAFAEL SAMAYOA, P., and ARTURO SAGASTUME, D. J. Algunas especies maderables de nuestros bosques. **[Some timber-yielding species from our forests.]** *Rev. agric. Guatemala* 2 (21/26), 1946 (298–303). [Span.] E.M.B.

Pinus montezumae, P. occidentalis, Cupressus benthamii, Ochroma lagopus, Swietenia mahagoni, Cedrela odorata, Enterolobium cyclocarpium and *Helycostilis ojoche.*

[254]. 31.0 (81) : 01.2 : 02.41 : 33.91. SOUZA, P. F. DE. Madeiras de construção e acondicionamento. **[Timbers for building and box-making.]** *Brasil madeireiro* 3 (29), 1947 (7–16). 15 refs. [Port.]

The author makes a plea for grading Brazilian timbers and standardizing nomenclature. Alphabetical lists of vernacular names used in each state are included; also a systematic classification of species with their most common vernacular names.

[255]. 31.0 (94) : 33 : 34.2. BOAS, I. H. **The commercial timbers of Australia; their properties and uses.** Coun. sci. industr. Res. Aust. 1947. pp. 344 + 38 photos. 928 refs.

The work is divided into 2 sections:—(1) General technology. (2) Properties and uses of Australian timbers.

[256]. 31.0 : 12.25–9. **The Boxwoods.** *Wood* 13 (5), 1948 (130–2).

Buxus sempervirens, B. macowani, Gonioma kamassi, Canthium dicoccum, Gardenia latifolia, Phyllostylon brasiliensis, Gossypiospermum praecox, Tristania conferta.

[257]. 31.0 : 12.25–9. DESCH, H. E. **The [hardwood] Cedars. Softwood Cedars.** *Wood* 13 (2; 3), 1948 (40–2; 74–6).

Two papers, dealing respectively with : (1) Central American Cedar (*Cedrela mexicana*), Toon (*Cedrela toona*), 'Borneo Red Cedar' (*Shorea* spp.), 'Borneo White Cedar' (*Parashorea malaanonan*), 'Ceylon Cedar' (*Melia composita*), 'Nigerian Cedar' (*Guarea thompsonii*), 'Dryzone Cedar' (*Pseudocedrela kotschyi*), 'Nigerian Cedar' (*Gossweilerodendron balsamiferum*). (2) *Cedrus deodara, Juniperus* spp., *Libocedrus decurrens, Thuja* spp., and *Chamaecyparis* spp.

[258]. 31.0 : 12.25–9. **[Information on timbers.]** *Reprs.* from *Holz* 3, 1940 (175; 247; 395; 443); 4, 1941 (199; 231; 411). [G.] P.R.

Leaflets summarizing properties, uses, etc., of: *Terminalia superba, Abies alba, Carpinus betulus, Ulmus* spp., *Ochroma lagopus, Populus* spp., and *Swietenia mahagoni*. Each leaflet has a short bibliography of the species dealt with.

[259]. 31.0 : 12.26–8. Le Limba. **[Afara (*Terminalia superba*).]** *Bull. Compt. Vente Bois congol.* 3 (22), 1948 (2–9 + 6 photos, 2 drawings, 1 map). 12 refs. [F.] P.R.

[260]. 31.0 : 12.26–8. **[Colonial timbers.]** *Bois For. Trop.* 4 (4), 1948 (47–50; 51–4); 5 (1), 1948 (37–40; 41–4). [F.]

Aboudikro-Sapelli (*Entandrophragma cylindricum*), Dabéma (*Piptadenia africana*), Bahia (*Mitragyna ciliata*) and Dibétou (*Lovoa triclisioides*).

[261]. 31.0 : 12.26–8. LAMB, G. N. **Foreign woods—origin, use, properties and nomenclature.** *Wood Prod.* 53 (4), 1948 (24).

Triplochiton scleroxylon, Sarcocephalus diderrichii, Poga oleosa, Entandrophragma cylindricum.

[262]. 31.0 : 12.26–8. Bois coloniaux: Niové. **[Colonial timbers: Niové [*Staudtia gabonensis* and *S. kamerunensis*].]** *Rev. Bois Appl.* 3 (4), 1948 (32–3). [F.]

[263]. 31.0 : 12.26–8. **Specimen woods, Nos. 146–9.** *Suppls.* to *Wood* 13 (2–5), 1948 (43–4; 77–8; 103–4; 133–4).

Baramalli (*Catostemma fragrans*), Tamo (*Fraxinus mandshurica*), Keruing (*Dipterocarpus* spp.), and Hackberry (*Celtis occidentalis*).

[264]. 31.0 : 12.26–8. BRUSH, W. D. **Pacific Dogwood.** ***Cornus nuttalli*, Audubon.** *Amer. Forests* 54 (5), 1948 (216–7).

[265]. 31.0 : 12.26–8. **The properties of Australian timbers: Sugar Gum (*Eucalyptus cladocalyx* F.v.M.); Jarrah (*E. marginata*).** *For. Prod. News Lett. C.S.I.R. Aust.* Nos. 158, 1947 (4); 160, 1948 (3).

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 10 (Nos. 119, 271, 279, 288, 503, 525).

[266]. 31.1 : 01.4. SPEARIN, W. E., and ISENBERG, I. H. **The maceration of woody tissue with acetic acid and sodium chlorite.** *Science* 105 (2721), 1947 (214). 4 refs. D.S.I.R.

Describes a method, less drastic than that commonly used, for separating cells for microscopic examination, using acetic acid and sodium chlorite. Gives schedules showing recommended duration, concentration and temperatures.

[267]. 31.1 : 07.7. DADSWELL, H. E., ECKERSLEY, A. M., GRIFFIN, F. V., and INGLE, H. D. **The extension of the card-sorting method to war-time problems in timber identification.** *J. Coun. sci. industr. Res. Aust.* 20 (3), 1947 (321–37). 9 refs. P.R.

During the war the Division of Forest Products developed a card-sorting key as a simple means of identifying timbers in various Pacific operational areas. A detailed description is given of:—(*a*) the first sample card-sorting key for timbers of the South-West Pacific area, and (*b*) the modified and finally adopted card-sorting key for New Guinea timbers. Various factors in this type of identification key and its value for field identification are discussed. *From authors' summary.* [Cf. *For. Abstr.* 7 (No. 1198).]

[268]. 31.1 : 33.8. FITZGERALD-LEE, G. **The identification of aircraft timbers.** *Aircr. Engng.* 20 (229), 1948 (70–3). P.R.

[269]. 31.1 : 12.26–8 (82). COZZO, D. Relación anatómica entre la estructura del leño de las especies argentinas de *Capparis* y *Atamisquea*. **[The anatomical relationship**

between the wood structure of the Argentine species of *Capparis* and *Atamisquea*.] *Repr.* from *Lilloa* 12, 1946 (29–37 + 2 photos). 16 refs. [Span.e.] X.

[270]. 31.1 : 31.3 : 33.32. RUNKEL, R. Über die Baumechanik der Zellgewebe und Membranen verholzter Pflanzen und ihre Bedeutung für die Eigenschaften künstlicher Zellwandgefüge (Papiere). [**The structural mechanics of the cellular tissue and membranes of woody plants and its importance to the properties of artificial materials (papers) formed of cell walls.**] *Mitt. Reichsinst. ausl. kolon. Forstw.* No. 4, 1944. pp. 18. 35 refs. [G.]

31.2. *Physical Properties*

See also *For. Abstr.* 10 (Nos. 119, 386).

[271]. 31.2 : 12.25 (493) : 31.1 : 24.2. FOUARGE, J., and SACRÉ, E. Analyse physique, mécanique et anatomique de bois de pin sylvestre, *Pinus silvestris* L. [**Physical, mechanical and anatomical analysis of the wood of *Pinus sylvestris* L.**] *Bull. Inst. agron. Gembloux* 12 (1/4), 1943 (14–41 + 6 tbls.). 10 refs. [F.flem.e.g.] E.M.B.

An analysis of wood of *Pinus sylvestris* from various parts of Belgium on the lines of the study made in 1938 of *P. nigra* var. *calabrica* [cf. *For. Abstr.* 2 (44)]. Specimens from the base of the trunk, disregarding the width of the annual rings, were with a few exceptions superior in strength and almost always harder and denser than those from the middle or top. In the same trunk, disregarding the width of annual rings, the coefficient of volumetric shrinkage diminished from the base upwards. The optimum breadth of annual rings cannot definitely be fixed, but in the region of 1·5 mm. good quality wood is obtained. Stands should be dense at first with light but frequent thinnings, which become progressively heavier and less frequent. A comparison is made of the qualities of *P. sylvestris* with those of *P. nigra* var. *calabrica*, with suggested uses.

31.21. *Conductivity*

See also *For. Abstr.* 10 (No. 275).

[272]. 31.21.4. THUNELL, B. Beräkning av temperaturfördelningen i skivor och cylindrar av trä då fortvarighetstillstånd icke råder. [**Calculation of the temperature distribution in wooden panels and cylinders in the unsteady state.**] *Medd. Svenska Träforskn-Inst.* (*Trätekn. Avd.*) No. 14, 1947. pp. 16. [Sw.e.] P.R.

31.22. Relation to Water, Air, Gases

See also *For. Abstr.* 10 (No. 64).

[273]. 31.22.1 : 07.7. BROCKELSBY, C. F. **Electrical moisture meters, with particular reference to timber and wheat.** *Marconi Instrumentation* 1 (3), 1947 (41–5). D.S.I.R.

[274]. 31.22.1 : 07.7. CARSTEN, E. **Moisture meter for timber.** *J. sci. Instrum.* 24 (8), 1947 (219). P.R.

Describes a Swedish electrical moisture meter designed for operation from A.C. mains; its action depends on the change in capacity of a condenser when the material under investigation is placed in its stray field.

[275]. 31.22.1 : 31.21.4 : 33.36.1 : 33.31 : 07.7. ANGELL, H. W., and MCFARLAND, W. A. **The use of electrical moisture meters on treated wood.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (397–413). Cf. *For. Abstr.* 9 (No. 2253).

[276]. 31.22.1 : 33.4. STANBURY, G. R., EWELL, R. H., and MESSING, R. F. **Studies in wood moisture content.** *Rep. Brit. Intell. Obj. Sub-comm.* No. B.I.O.S./J.A. P.P.R./1548 [*n.d.*] pp. 24 + 6 photos. P.R.

Describes moisture-content tests made on sample boards placed in houses in Florida, reproducing Japanese ventilation procedure, to simulate the moisture content of wood in inhabited houses in Japan in connexion with incendiary bomb evaluation tests.

31.23. Weight. Specific Gravity

See also *For. Abstr.* 10 (No. 284).

[277]. 31.23 : 01.4 : 07.7. MARKWARDT, L. J., and PAUL, B. H. **Methods of determining the specific gravity of wood and wood-base materials.** *Proc. Amer. Soc. Test. Mater.* 46, 1946 (1520–39). 11 refs. P.R.

Summarizes the various methods and laboratory techniques, including measurement and immersion (in water and mercury) techniques, new rapid approximate methods of estimating

specific gravity and a description of apparatus to facilitate evaluation. Discusses the advantages and disadvantages of the various methods and presents in tabular form a check list for selecting the method recommended for specimens of different sizes, shapes and moisture conditions.

[278]. 31.23 : 01.4 : 07.7. BETHEL, J. S., and HARRAR, E. S. **A method of determining the specific gravity of small wood samples.** *Trop. Woods* No. 93, 1948 (53–6).

The standard volume-displacement method proved difficult and time consuming for the measurement of the specific gravity of a large number of short increment borings and the authors developed a volumeter (illustrated and described) which proved accurate and easy to use.

31.25. Hardness

[279]. 31.25 : 12.26–8 : 33.4 : 31.1 : 31.23. ARMSTRONG, F. H. **Flooring hardwoods; their wear and anatomical structure.** *Bull. For. Prod. Res., Lond.* No. 21, 1948. pp. 12 + 20 photos. 1 ref. P.R.

An analysis of the surface wear and breakdown of hardwood flooring under heavy industrial and other traffic is illustrated by photo-micrographs of several representative species. It is shown that, in general, the resistance of wood surface to actual breakdown and disintegration is not entirely related to density but is appreciably affected by anatomical structure and, in particular, the arrangement, size and distribution of the pores. Diffuse-porous hardwoods of coarse texture tend to break down by a collapse of the large pores followed by rupturing of other wood tissue, and this is accentuated when the pores are arranged in oblique lines or when their numbers are great, resulting in a splintering of the surface. Hardwoods with small diffuse pores suffer a local, uniform compression or consolidation of the structural elements as a whole, resulting in some cases in comparatively smooth and even wear and in others in a slight 'picking-up' of the surface fibres. The wear in this latter case is mainly quantitative, being roughly related to density.

The resistance to surface breakdown of the ring-porous hardwoods is largely dependent on the rate of growth, and the slow-grown material may be somewhat similar in behaviour to hardwoods with large diffuse pores. With fast-grown hardwoods the preponderance of summerwood usually gives sufficient resistance to surface breakdown to offset the weakness of the narrow springwood zone. Quarter-sawn, ring-porous hardwoods with broad rays prominent on the surface tend to break down by flaking along the lines of the rays owing to the uneven support of springwood and summerwood.

The impregnation of the pores with a supporting medium such as rosin-wax solution results in a considerable increase in the resistance to surface wear and breakdown. *Author's summary.*

31.27. Mechanical Strength

See also *For. Abstr.* 10 (Nos. 287, 368–9, 374–80, 384–6, 388, 398, 568, 573, 575–8, 583, 642–3, 648, 651).

[280]. 31.27. KITAZAWA, G. **Relaxation of wood under constant strain. (A study of the visco-elastic property of wood).** *Tech. Publ. N.Y. St. Coll. For.* No. 67, 1947. pp. 12. 5 refs.

[281]. 31.27 : 01.4. KOLLMANN, F. Internationale Normung der Prüfvorschriften für Holz. **[International standardization of specifications for testing timber.]** *Repr.* from *Silvae Orbis* 15, 1944. pp. 12. [G.] P.R.

Discusses some of the difficulties in standardizing tests of compressive strength, tensile strength, shear strength and static and impact bending strength.

[282]. 31.27 : 12.25 : 31.1. FREY-WYSSLING, A., and STÜSSI, F. Festigkeit und Verformung von Nadelholz bei Druck quer zur Faser. **[Strength and deformation of coniferous wood in compression perpendicular to the grain.]** *Schweiz. Z. Forstw.* 99 (3), 1948 (106–14). 2 refs. [G.f.]

Tests have revealed some radical and characteristic differences between the behaviour of coniferous wood in compression perpendicular to the grain and its behaviour in compression parallel to the grain.

In Norway Spruce, radial compression to failure causes tangential displacement of the early wood. When the angle of the force applied is varied progressively from the radial to the tangential plane, or *vice versa*, crushing strength decreases and deformation increases

disproportionately up to 45° (midway between the two planes). Only structural features of the wood in transverse section (stresses applied to approximately rectangular cells at various angles) can explain this phenomenon, which is analysed theoretically, with illustrative diagrams and confirmatory evidence from microscopic studies. In view of this behaviour, the authors have coined the terms 'form strength' and 'form elasticity' to express its dependence on structure.

It was further shown during the same series of tests that crushing strength is greater, and deformation smaller, in the radial than in the tangential direction, a fact which can only be attributed to the transfer of stress from one ring of latewood to another by means of the rays, which thus act as a reinforcement to the early wood.

[283]. 31.27 : 31.21.33. STÜSSI, F. **Strength of timber subjected to stresses oblique to the grain.** [Holzfestigkeit bei Beanspruchung schräg zur Faser.] *Transl. Minist. Wks., Lond.* No. 27, 1948. pp. 3 + dgms. + graphs. Translated by H. L. Maple and K. Simon from *Schweizerische Bauzeitung* 128 (20), 1946 (251–2). P.R.

A method is suggested for calculating the strength of wood under tension applied at an angle to the grain, in terms of the shear and tensile strengths parallel and perpendicular to the grain. At small angles of inclination between the stress direction and the grain direction, the strength is determined by the tensile strength along the grain. At intermediate angles, it is determined by the shear strength, and at large angles by the tensile strength across the grain. Results of previous investigations by Kraemer and Baumann are re-examined in the light of these ideas. R. F. S. HEARMON.

[284]. 31.27 : 12.25 : 12.26–8 (471) : 31.23 : 21.6. JALAVA, M. Suomalaisen männyn, kuusen, koivun ja haavan lujuusominaisuuksista. [**Strength properties of Finnish Pine, Spruce, Birch and Aspen.**] *Commun. Inst. for. Fenn.* 33 (3), 1945 (1–66). [Fi.e.]

Reports in detail on an extensive series of strength tests by standard Madison methods, with tables and graphs to illustrate the results obtained. For the conifers the summerwood % was also determined. To indicate something of the range of variation in strength properties, the author presents frequency curves for specific-gravity values. The curve for Scots Pine shows two peaks, owing to the presence of two distinct populations—a light-wooded group comprising all samples from Lapland and those of fast-grown trees in S. Finland, and a heavier-wooded group representing samples from S., S.E. and central Finland. The latter group, when graphed separately, still shows irregularities due to site differences. On the whole, Pine showed a far wider variation in specific gravity than did the remaining species tested.

A special study was also made of variation in specific gravity in different parts of the stem. Results for Scots Pine indicate that specific gravity increases from the centre to the periphery in the horizontal plane and decreases from butt to crown. The highest average values were given by trees of the 3rd crown layer, followed by those of the 4th and then those of the 1st and 2nd layers. This order, however, differed at different ages; and since it appears that the heaviest wood is formed when the rate of growth is medium, the maximum specific gravity is transferred successively to the higher crown layers as the stand grows older. The lower average specific gravity of trees in the two uppermost crown layers is due to their light inner wood, laid down in youth while growth was very rapid.

Variation of specific gravity with position in the tree and rate of growth, was much less pronounced in Spruce and Birch than in Pine. Contrary to the general opinion that the best hardwood timber is that from the quickest-grown trees, Birch samples from young, fast-grown material were rather lighter than that from older, less rapidly grown wood.

In conclusion, some deductions are made as to the optimum conditions for timber quality in Scots Pine and Norway Spruce, and stress is laid on the importance, in silviculture and utilization, of recognizing the variation in wood density with rate of growth and position in the tree.

[285]. 31.27 : 12.25 (943). KLOOT, N. H. **Tests on small clear specimens of North Queensland Kauri (*Agathis palmerstoni* F.v.M.).** *J. Coun. sci. industr. Res. Aust.* 20 (3), 1947 (345–60). 7 refs. P.R.

Details of mechanical tests carried out on five trees of North Queensland Kauri. No

detailed analysis of results was made owing to the small number of specimens, but a comparison with *Araucaria bidwilli* and *Picea sitchensis*, which have a similar density, shows that Kauri has a lower strength/weight ratio for most of the important properties, particularly in tensile strength, modulus of elasticity and impact strength. Although a mild form of compression wood was found in all 5 trees, there was no evidence that this affected the test results. *From author's summary.*

31.28. Working Qualities

[286]. 31.28 : 12.26–8. DAVIS, E. M. **Machining and related properties of Aspen [*Populus tremuloides*].** *Lake St. Aspen Rep.* No. 8, 1947. pp. 8.

31.3. *Chemical Properties*

See also *For. Abstr.* 10
(Nos. 270, 416, 420, 594, 615).

[287]. 31.3 : 31.27 : 31.8 : 12.25. ZHEREBOV, L. P. Mekhanicheskie funktsii khimicheskikh ingredientov drevesinȳ. [**Mechanical functions of the chemical constituents of wood.**] *Bumazhnaya Promȳshlennost'* 21 (3/4), 1946 (14–26). 2 refs. [Russ.] L.S.

Wood samples were taken from the upper and lower sides of transverse sections cut at intervals along a practically horizontal Scots Pine branch 6 m. long, the first 3 m. of which were formed while the tree grew in a closed stand and the branch was scarcely subject to stresses imposed by wind or snow, whereas the remainder bore living branchlets, having developed after the tree became a marginal one as result of a clearing. Throughout its length, the branch was excentric in section and showed compression wood on the under side. Chemical analysis of these samples showed that: (1) The resin content, which was practically equal in the upper and lower sides of the branch, decreased for the first metre of length and then gradually increased towards the apex. (2) The ash content increased as far as the first living branchlets and then gradually decreased towards the apex. In the first 2 m. it was practically uniform in upper and lower samples, in the second 2 m. it was less in the samples from the lower side, and at the apex in those from the upper side. (3) The lignin content decreased gradually from base to apex and was greater throughout on the under side of the branch, where, calculated on the green weight of the sections, 1½–2 times as much lignin was formed as on the upper side. (4) The (pure) cellulose content was greatest in middle sections and practically equal at base and apex. In contrast to lignin, it was consistently greater in the upper side of the branch. (5) Total pentosans varied little with position in branch, either longitudinally or radially. (6) The pentosans associated with cellulose (taken as pentosans in Cross and Bevan cellulose) increased along the upper side, and decreased along the under side, from base to apex of the branch. (7) Pentosans associated with lignin (taken as those not included in Cross and Bevan cellulose) showed the opposite tendency, i.e. decreased along the upper and increased along the lower side from base to apex. On the upper side the ratio of these pentosans to lignin was constant (at about 28%), thus suggesting a true chemical association of these constituents. On the lower side there appeared to be an inverse relationship between lignin and the pentosans not included in Cross and Bevan cellulose, the minimum lignin content and the maximum content of these pentosans occurring at the third metre of length. (9) Of the hemicelluloses, the content of mannan and laevulan was 25% greater in the lower than in the upper side of the branch. This result is based on samples from the mid-length of the branch only, but suggests that these substances are associated with lignin rather than cellulose. Figures are also included for galactan and glucan.

The results, which are shown in tables and graphs, indicate that mechanical stresses affect not only the structure but also the composition of the wood. Where compression exists, the inelastic but compression-resisting lignin complex increases at the expense of the cellulose complex, whereas in tissues under tension the elastic cellulose complex, resistant to tearing, increases at the expense of the lignin. The average lignin contents of the upper and lower side of the branch were respectively 30·91 and 35·7%, the corresponding figures for cellulose 46·37 and 40·8%. The pentosans of Cross and Bevan cellulose are apparently not a chance admixture but contribute directly to the mechanical functions of the cellulose, since they were consistently present in greater quantities in tissues under tension. For the upper and lower sides of the branch the average contents

of such pentosans were respectively 17·00 and 15·33%. On the upper side of the branch the direct correlation of the remaining pentosans and the lignin with which they are considered to be associated, may be due to the mainly physiological role which this complex plays in that region. On the lower side, their relations are more obscure, but the evidence suggests that though this complex as a whole varies directly with the stress imposed, yet within the complex lignin increases and pentosans decrease at the regions of maximum stress. It is doubtful, however, to what extent the figures for the two groups of pentosans are independent, since methods of analysis are as yet insufficiently refined to identify pentosan linkages (not everywhere of equal chemical resistance) in detail, e.g. in isolating Cross and Bevan cellulose, some lignin-pentosan bonds may be hydrolysed. It is noteworthy that between the third and fourth metres from the base, the cellulose pentosans decreased on the upper and increased on the lower side, simultaneously with a decrease of lignin pentosans and an increase of lignin to a temporary peak for the distal half of the branch.

[288]. 31.3 : 01.4 : 31.1 : 12.26–8. JAYME, G., and HARDERS-STEINHÄUSER, M. Über eine neue Methode zum mikroskopischen Nachweis des Protolignins in pflanzlichen Zellwänden und ihre Anwendung auf Buchenholz. [**On a new method for the microscopic determination of protolignin in plant cell walls and its application to Beech wood.**] *Holzforschung, Berlin* 1 (2), 1947 (33–42). 25 refs. [G.g.] P.R.

The assertions of Harlow and Staudinger [see *For. Abstr.* 6 (237)] that practically no lignin exists in the secondary cell wall of deciduous wood fibres is contradicted by the fact that good-quality sulphite cellulose can be obtained from Beech. If no 'protective' lignin were present in the cell wall, the resulting pulp would be of poor quality owing to the direct action of the acid on the cellulose. A critical study of earlier microscopic methods of determining lignin shows that these are apt to be fallible, particularly when applied to the lignin of deciduous species, which differs chemically from that of Spruce, the chief object of earlier investigations. Extraction of Beech specimens with 1 : 1 methanol/benzol, followed by treatment with N_2O_4 caused the whole lignin complex to react with a bright yellow colour, which deepened with the action of triethanolamine. A microscopic study of these specimens established the presence of lignin in considerable quantity in the secondary cell walls of the fibres, though the amount was unevenly distributed in any one annual ring.

[289]. 31.3 : 12.25. WALD, W. J., RITCHIE, P. F., and PURVES, C. B. **The elementary composition of lignin in Northern Pine and Black Spruce woods, and of the isolated Klason and periodate lignins.** *J. Amer. chem. Soc.* 69 (6), 1947 (1371–7). 31 refs. D.S.I.R.

[290]. 31.3 : 12.26–8. BOND, W. J., GODDARD, I. G., and WRIGHT, G. F. **The isolation of Sassafras lignin.** *Canad. J. Res.* 25B (6), 1947 (535–9). 10 refs. P.R.

Lignin was extracted from the wood with hot acetic acid and was found to resemble lignins from other deciduous woods in methoxyl content and solubility. It appears to contain none of the methylenedioxy linkage characteristic of the piperonyl nucleus.

[291]. 31.3 : 01.4 : 12.26–8. ROGERS, S. C., MITCHELL, R. L., and RITTER, G. J. **Method for isolation of hemicelluloses directly from Maple wood.** *Analyt. Chem.* 19 (12), 1947 (1029–32). 14 refs. P.R.

A method of preparing hemicelluloses from hardwoods, using treatments with concentrated and dilute KOH solutions. Yields based on the ash-free lignin-free, oven-dry hemicelluloses obtained are approximately 14·5% of the weight of oven-dried Sugar Maple wood; this exceeds yields obtained by previously published single-extraction methods. The time needed to isolate hemicelluloses directly from wood has been shortened. *From authors' summary.*

[292]. 31.3 : 12.25 : 12.11.11. ANDERSON, E., and PIGMAN, W. W. **A study of the inner bark and cambial zone of Black Spruce (*Picea mariana* B.S.P.).** *Science* 105 (2736), 1947 (601–2). D.S.I.R.

Tabulates the results of analyses of small samples of 6 layers, comprising outer bark, inner bark, cambial zone, young sapwood, sapwood and heartwood, separated from a 65-year-old Black Spruce, and discusses the results obtained from extracting larger portions with hot benzene, alcohol and water, and from converting the inner bark into holocellulose, which was successively extracted with a 3%

solution of NH_4OH and a 5% solution of NaOH. The work is incomplete and will be continued.

[293]. 31.3 : 12.26–8. BRANDT, C. W., and ROSS, D. J. **Podocarpic acid as a source of oestrogenic hormone.** *Nature, Lond.* 161 (4101), 1948 (892).

Podocarpic acid occurs as crystalline 'heart shakes' in the wood of *Dacrydium cupressinum*. Preliminary physiological tests suggest that podocarpinol possesses oestrogenic properties.

[294]. 31.3 : 12.25. ERDTMAN, H., and GRIPENBERG, J. **Antibiotic substances from the heart wood of *Thuja plicata* Don.** *Nature, Lond.* 161 (4097), 1948 (719). 2 refs.

From heartwood of *Thuja plicata* grown in Sweden the authors isolated dehydroperillic acid and 3 isomerides with melting points 82°, 52–52·5°, and 34° C. respectively. The structure of these is discussed and it is proposed that they should be termed γ-, β-, and α-thujaplicin respectively.

[295]. 31.3 : 12.26–8 (931). REID, J. S. **Silica in Beech timbers.** *N.Z. J. For.* 5 (4), 1947 (330–1).

Compares the silica content of wood of 3 *Nothofagus* species with that of some overseas species, and gives the results of some microscopic studies to show variations in silica content with habitat in *N. solanderi*, *N. cliffortioides* and *N. truncata*.

[296]. 31.3 : 12.26–8 : 34.24 : 33.3. RITTER, G. J., and HOSSFIELD, R. L. **Chemical utilization of Aspen.** *Lake St. Aspen Rep.* No. 4, 1947. pp. 19. 12 refs.

A detailed analysis of the wood of *Populus tremuloides*, compared with that of other American hardwoods, an analysis of the bark, its pulping qualities and suggestions for its utilization.

31.4. *Durability. Decomposition*

See *For. Abstr.* 10 (No. 574).

31.42. Attack by Plant Organisms

See also *For. Abstr.* 10
(Nos. 365, 401, 571, 575–7, 645).

[297]. 31.42.11 : 12.11.15 : 12.21. NORD, F. F., and SCIARINI, J. **On the mechanism of enzyme action. Part 27. The action of certain wood-destroying fungi on glucose, xylose, raffinose and cellulose.** *Archives of Biochemistry* 9 (3), 1946 (419–37). 31 refs. L.S.

A study of the carbohydrate metabolism of the 4 wood-rotting fungi, *Merulius niveus*, *M. tremellosus*, *M. confluens* and *Fomes annosus*. The investigations indicate that they are perfect alcohol fermenters and can utilize glucose, xylose, raffinose and cellulose, producing stoichiometric amounts of alcohol from the first 3 carbohydrates aerobically. The ethyl alcohol so formed is subject to a dehydrogenation, whereby substantial amounts of acetaldehyde and acetic acid can be isolated and identified. Succinic acid is also formed. [See *For. Abstr.* 9 (No. 1622).]

31.43. Attack by Animal Organisms

See also *For. Abstr.* 10
(Nos. 129, 132, 487–94, 645).

[298]. 31.43 : 13.2 (431–5) : 33.36.1. ZUMPT, F. Der Hausbock. [**The house longhorn beetle.**] *Merkbl. Reichsinst. Forst- u. Holzw., Hamburg* (*Reihe* 2) No. 2, 1947. pp. 20. 23 refs. [G.e.f.span.]

Discusses the prevalence of *Hylotrupes bajulus* in Germany, methods of control, official measures enforced in Germany since 1934 and the present situation.

[299]. 31.43 : 13.2 : 12.26–8 (943). BRIMBLECOMBE, A. R. ***Lyctus* (powder post) beetles in Queensland timbers.** *Qd. agric. J.* 65 (3), 1947 (172–86). E.M.B.

Includes a list of Queensland commercial timbers susceptible to *Lyctus* attack. [Cf. *For. Abstr.* 8 (Nos. 306, 461, 1145, 1367, 2587); 10 (Nos. 311–2).]

[300]. 31.43 : 32.26 : 41. PREBBLE, M. L. **Borer damage in log skidways.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 1 (6), 1945 (2–3).

Preliminary report on a study of the effect of spraying log skidways with DDT emulsions for the control of borers. The results were inconclusive.

[301]. 31.43 : 12.26–8 (728) : 13.2. WOLCOTT, G. N. **The resistance to dry-wood termite attack of some Central American woods.** *Carib. For.* 9 (1), 1948 (53–6). [E.Span.f.]

Further tests have been made [cf. *For. Abstr.* 8 (No. 2466)] to determine the natural durability of certain Central American woods with a local reputation of being resistant to termite attack. *Lysiloma bahamensis* and *L. latisiliqua* were fairly resistant. Others moderately resistant were *Samanea saman*, *Guarea trichilioides*, *Terminalia amazonia*, *Anacardium excelsum*, *Enterolobium cyclocarpum* and *Carinata pyriformis*. Contrary to their local reputation, the following species were found to be susceptible to attack: *Bombacopsis quinatum*, *Carapa nicaraguensis* and *Calophyllum brasiliense* and the 'mélon' of Nicaragua, a species of *Phyllostylon*. [Cf. *For. Abstr.* 10 (No. 492).]

[302]. 31.43. WEISS, C. M. **An observation on the inhibition of marine wood destroyers by heavy fouling accumulation.** *Ecology* 29 (1), 1948 (120).

[303]. 31.43 : 12.26–8 (81). HORN, E. F. **Teredo-resistant timbers of the Amazon valley.** *Trop. Woods* No. 93, 1948 (35–40). Cf. *For. Abstr.* 9 (No. 1624).

[304]. 31.43 : 13.2. SPOON, W. Een paalwormproef in Nederland met Indische en Surinaamsche houtsoorten. [**A marine-borer test carried out in Holland, using timber species from the Netherlands Indies and Surinam.**] *Ber. HandMus. kolon. Inst. Amst.* No. 195, 1943. pp. 15. 12 refs. [Du.]

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 10 (Nos. 156, 244–5, 287, 381, 548).

[305]. 31.8 : 12.25 : 22.88.2 : 21.62. PAUL, B. H. **Knots in second-growth Douglas-Fir.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1690, 1947. pp. 9 + 10 photos, 2 dgms., 1 tbl. 1 ref. P.R.

Describes and tabulates results of a study of some 1,000 knots from second-growth Douglas Fir to determine facts relating to the development of branches and knots, their number and size, the number of years the branches remain alive, and how long they persist after death at different heights in the tree under varying conditions of site and density of stocking.

[306]. 31.8 : 33.03 : 56 : 65.7 : 12.25. HORNE, R. C. **Better plywood cheaper: peeler log study.** *Timberman* 49 (5), 1948 (92, 94, 96).

A study of the effect of density of stocking on the percentage of clear veneer that can be peeled from a given log. Sixty Douglas Fir peeler logs were examined and the following data recorded: diameter after barking, at small end (38–72 in., average 50·9 in.); radial growth from pith outwards for first 50 years (7·5–32 cm., average 19·7 cm.); diameter of peeler block when first knot appeared (12–50 in., average 31·5 in.); the diameter of the core when peeling was discontinued. The basal area of the original log was computed, and also the area remaining after peeling. Percentage of utilization to the first knot was expressed as $\frac{BAX}{TBA} \times 100$, where BAX = basal area of annulus of wood outside the first knot, and TBA is basal area of original log at small end. These data are presented in a table. The percentage of utilization to first knot is plotted against growth during first 50 years. Although the graph shows a great deal of dispersion, there is a definite correlation between rate of growth during the first 50 years and the percentage of clear veneer that can be cut. Of the 60 logs examined, 28 gave 65% or more, clear, knot-free veneer and 22 of them were below average in rate of growth in first 50 years; of the 32 logs which gave less than 65% clear, 26 showed growth rate above the average. It is considered very probable that variation in site quality accounts for much of the wide dispersion on the graph.

32. HARVESTING OF WOOD. LOGGING

See also *For. Abstr.* 10 (No. 347).

[307]. 32 : 67. AUFDERHEIDE, R. **Advantages of a detailed pre-sale lay-out and logging plan.** *For. Res. Notes Pacif. Nthwest. For. Exp. Sta.* No. 42, 1948. pp. 7 + plan.

[308]. 32 : 76 : 12.25 : 22.14.2 : 33.32. **Financial aspect of growing and harvesting Spruce pulpwood.** *Rep. Lake St. For. Exp. Sta.* 1947 (11–12).

A study was made of the comparative costs and yield of Black Spruce pulpwood operations when cutting to 4-in., 3-in., and 2½-in. minimum top diameter respectively. It was found

that the greater cost of cutting smaller sized wood was offset by the greater yield per acre, so that total delivered cost was not significantly different in the 3 kinds of cutting. Pulping experiments showed that 2½-in. wood went through the barkers without loss; strength tests on the pulp showed no significant differences, but the small wood may provide rather more waste because of a higher proportion of knots.

[309]. 32 : 76.1 : 33.1. CAMPBELL, R. A. **Estimating your logging and milling costs.** *Sth. Lumberm.* 76 (2209), 1948 (50, 52, 54, 56).

Includes a table showing man-hour requirements per 1,000 bd. ft. by tree size, distinguishing those operations that are relatively constant from those that vary with tree size; also a graph showing the effect of tree size on logging and milling costs for (1) Yellow Pine, (2) hardwoods.

32.2. *Felling and Related Operations*

[310]. 32.2 : 07.7. **The 'Shervick' industrial tractor.** *Engineer, Lond.* 185 (4812; 4813), 1948 (400–1; 430–1). D.S.I.R.

The tractor, which uses the principal components of the standard 'Sherman' Mark III tank mounted in a specially designed punt-shaped steel frame, was designed and built in connexion with the E. African groundnut scheme. Special implements which can be attached are: the treedozer with felling arm and stumper blade, enabling felling and stumping to be done in one operation; the root cutter; and the root rake.

[311]. 32.22 : 31.43 : 12.26–8 : 12.11.16 : 31.3. BRIMBLECOMBE, A. R. **Starch depletion and death of Spotted Gum trees.** *Repr.* from *Journal of the Australian Institute of Agricultural Science.*

Experiments were made in high ring-barking of *E. maculata* for starch depletion for the purpose of giving immunity to *Lyctus* attacks [cf. *For. Abstr.* 8 (No. 306)]. This species is not difficult to kill by ring-barking at breast height, and it was feared that high ring-barking might kill the tree before starch resorption was complete. However, complete depletion occurred in most trees within 6 months and in all trees within 8 months, and all trees were then still alive. The ring-barking was light, i.e. bark only was removed, in a ring 3–4 in. wide, with a minimum of injury to the sapwood. Ten of the treated trees were left standing for a further period after depletion of starch. Some of these died within 2 months of depletion, others died 4 and 6 months after depletion, while one was still alive after 8 months.

[312]. 32.22 : 31.43 : 12.26–8 : 13.2 (944) : 12.11.11 : 31.3. TAYLOR, K. L. **High-ringing as a possible method of controlling *Lyctus*.** *N.S.W. For. Rec.* 1 (1), 1948 (17–22). 12 refs.

The writer reviews the work already published on the starch-depletion of *Lyctus*-susceptible tree species by light ring-barking at the top of the commercial bole [cf. *For. Abstr.* 8 (No. 306)], and then gives some account of experiments in New South Wales, begun in 1940, on *Eucalyptus maculata* and some rain-forest species (*Schizomeria ovata, Sloanea woolsii, Tarrietia argyrodendron, T. actinophylla, Litsea reticulata*). From results so far obtained, it is considered that high-ringing is a practical method for treating *E. maculata* but may not be so for the rain-forest species. The reason for the difference is apparently that *E. maculata* has only a narrow sapwood, compared with the other species tested, and therefore does not contain so large a quantity of starch to be resorbed by the tree.

Three methods of climbing trees to carry out the ringing were tried. Climbing stirrups were found to be impracticable on account of the size and taper of the boles. Extension ladders were difficult to handle, dangerous, and involved a waste of man-power for supporting them on the ground. Climbing spurs proved by far the most satisfactory and will be used exclusively in future work. They were at first considered unsuitable because it was supposed that the spur marks would afford entry to pinhole borers and fungus infection, but no such results have, in fact, followed their use.

Estimates of cost are only approximate because of the small number of trees treated but it is considered that the cost of high-ringing would not be greater than 5*d.* per 100 super ft. of treated log and might prove much less. The cost was slightly higher with extension ladder than with climbing spurs.

[313]. 32.25 : 07.7. SIMMONS, F. C. **Good logging practice. 7. Some pointers on power saws for logging.** *Timber of Canada* 8 (9), 1948 (40–3, 102–7).

[314]. 32.25 : 07.7. PARFENOV, G. M. Elektroenergiya dlya mekhanizatsii lesozagotovok. [**Electric power for the mechanization of logging work.**] *Lesnaya Prom.* 1948 (1), (8–10). [Russ.]

In view of the great demand for liquid motor fuels in mechanized logging operations in the Northern forests, and the expense and difficulty of supplying these areas from the South, the author outlines a scheme whereby a 22–25 kw generator unit driven by a steam engine (38 h.p. 'P–1' using logging waste for fuel) is placed in the centre of a logging area (350–400 ha., with a growing stock of 180–300 cu.m. per ha.) to supply current (20 kw) for 10–15 electric saws. As it would be uneconomic to use cable for a distance exceeding 350 m., construction of temporary overhead LT (220-volt) lines, attached to trees, would be used to cover greater distances up to 1,700–2,000 m., these lines being erected section by section as required. For a larger power supply a 75 h.p. steam engine and 50 kw generator would be needed. Such a station would supply the log depot with light and make possible mechanized loading, skidding, and the operation of electric saws for cross-cutting at the log depot at night. Where an HT power line traverses the forest it would be tapped via a transformer which would replace the engine and generator. Practical trials have been made in two logging concerns under the Sverdles Trust, where energy was supplied from a power line through a 30 kw, 3,000/220-volt transformer not only to the electric saws but also to other electric motors, with excellent results. The author has also made successful trials with the P–1 38 h.p. steam engine and 23 kw generator.

[315]. 32.25 : 07.7 (470). PATSIORA, P. P. Sinkhronnȳ generator s selenovȳm vozbuditelem. [**A synchronous power generator with a selenium exciter.**] *Lesnaya Prom.* 1947 (8), (4–7). [Russ.]

Describes a synchronous power generator devised by S. B. Yuditski, with particular reference to the employment (circuits are illustrated) of a transformer and selenium rectifier unit in place of a dynamo in the exciter circuit, as a means of stabilizing voltage when sudden loads are imposed or removed, e.g. by the switching on and off of electric saws in logging operations.

An account is also given of field tests of this apparatus in comparison with a similar plant having a D.C. dynamo exciter.

Results, which are illustrated by tables and graphs, show that the new device is considerably superior. It has the advantages of being simple to look after and reliable in operation; there are no moving parts in the exciter and no trouble with brush contacts; the selenium rectifiers are not damaged by jolting, weigh only 2·5 kg., and are not affected by weather.

[316]. 32.25 : 07.7 (47). LOMONOSOV, V. A., and SASS, A. YA. Mekhanicheskaya pila s traktorom STZ–3–NATI na valke. [**A power saw, operated by the STZ–3–NATI tractor, in felling operations.**] *Lesnaya Prom.* 1947 (9), (13–15).

Describes and illustrates a circular saw, designed by A. A. Maranov, attached to and operated by a producer-gas tractor. The apparatus, weighing about 120 kg., consists of a saw (0·9 m. diam. and making 790 revs./min.) in a swivel mounting (allowing it to be used vertically or horizontally) at the end of a tubular cantilever frame which is pivoted to permit vertical movement. The driving shaft is telescopic. A sprung telescopic lever arm is mounted to exert a push against the stem of the tree being felled. The apparatus has been working successfully for some months in a forest in Yaroslavl Province. In a trial in mixed 65- to 75-year-old Birch/Aspen with a Spruce understorey, 40 trees averaging 23·7 cm. diam. were felled in 1 hour 14 minutes. For trees over 30 cm. in diam. it was necessary to make a double cut. A larger blade, say 1 m. to 1·2 m. diam., should therefore be fitted. It is estimated that with this larger blade plus proper organization and a practised team (tractor-driver and one saw operator) it should be possible to fell 20–25 solid cu.m. of timber per hour.

[317]. 32.25.2 : 07.7 : 82. KILCHENMANN. Vergleich der Fällzeiten schiefer Bäume mit oder ohne Verwendung eines Seilzuges. [**Comparison of felling times for leaning trees with and without the use of a 'forest devil'.**] *Schweiz. Z. Forstw.* 99 (1), 1948 (42–9). [G.f.]

The time studies described (in which ordinary felling, with wedges, was compared with the use of (*a*) an old chain-type and (*b*) a new (Seilzug 'Greif') cable type of forest devil) showed that, in felling a leaning tree in a direction other than its natural line of fall, the

use of a 'forest devil' to exert the necessary pull becomes the more advantageous, the greater the turning moment and the stump diameter of the tree. The results are shown graphically, and, as it would be impracticable to make the necessary calculations for each tree, a tabular rule of thumb is presented, indicating for medium-height trees of different volume the deviation from the vertical at which it will pay to use the 'forest devil'.

[318]. 32.25.5 : 07.7. HOPKINS, W. C., and WOODBURN, R. **Bark-removing tools.** *Information Sheet Miss. agric. Exp. Sta.* No. 380, 1946. pp. [2]. P.R.

Two types of barking tool, designed at the Mississippi Agricultural Experiment Station, can be easily constructed from an ordinary long-handled, round-point shovel.

[319]. 32.25.5 : 07.7. SMITH, I. W. **Mechanical methods of bark removal.** *Sth. Lumberm.* 176 (2209), 1948 (74–6, 78). 13 refs.

Reviews the current methods and equipment for bark removal in the utilization of sawmill waste. Hand methods and barking devices used by the pulpwood industry and in post peeling are included for the sake of completeness. The various methods are classified under: (1) those employing knives; (2) those using mechanical friction; (3) those using hydraulic erosion. Fifteen different machines are described. Desirable improvements are indicated.

[320]. 32.25.5 : 07.7. LEAF, C. S. **Small hydraulic log-barker.** *Sth. Lumberm.* 76 (2209), 1948 (70, 72).

An exposition of the principles of hydraulic log-barking and what can and cannot be expected of it, illustrated by a detailed account of one particular barker.

[321]. 32.25.5 : 07.7. **New method of barking peelers.** *W. Cst. Lumberm.* 75 (1), 1948 (72, 118).

The Weyerhaeuser Timber Company's new mechanical barker removes bark by compression and shearing action, without cutting into the outer sapwood, thus securing both wood-free green bark and bark-free logs. The machine is operated by one man, and works about as fast as conventional equipment. The compression cylinder and shearing head may be mounted upon standard Rosser barkers now in use.

[322]. 32.25.5 : 07.7 : 33.53. **New pole barker perfected.** *Timberman* 49 (5), 1948 (50–1, 54).

Description of the Whitlock Whirl Barker, manufactured by the Atlas Manufacturing Co., Aberdeen, Washington and specially designed to handle heavy Douglas Fir transmission poles 40–100 ft. long.

32.7. *Loss in Logging. Incidental Waste*

See also *For. Abstr.* 10 (No. 615).

[323]. 32.7 (437). MACKO, L. Straty pri výrobe drevnej hmoty. [**Losses in the cutting of wood.**] *Pol'ana* 3 (1/2), 1947 (14–16). [Slovak.]

An analysis of losses in woods operations designed to assist forest workers to submit more accurate figures of 'production loss' as defined by the Ministry of Economy.

[324]. 32.7 : 91.8 : 91.7. MARQUIS, R. W. **Employment opportunities in full forest utilization.** *J. For.* 46 (5), 1948 (334–9).

Present methods of exploitation leave standing about 27% of the volume of sound timber removed from logged areas of the Douglas Fir region. The author analyses production from a typical area in order to illustrate the increase in products and employment which could result from felling this 27%, from making periodical thinnings and from fuller utilization of logs, cull and sawmill waste.

32.8. *Grading and Storage of Wood in the Rough*

See also *For. Abstr.* 10 (No. 638).

[325]. 32.8 : 33.01 : 12.26–8 (76 : 77). **Saw-log grades for hardwoods—Central states studies.** *Rep. U.S. For. Prod. Lab., Madison* No. *D*1699, 1947. pp. 22. P.R.

Discusses principles and methods of grading, arrives at hardwood sawlog grade specifications and tabulates comparative yield and value of logs of different species within the suggested grades.

32.9. *Transport*

[326]. 32.9 (794) : 76.1. O'Leary, J. E. **Timber transportation costs in the California Pine region.** *Abstr.* of thesis, in *J. For.* 46 (4), 1948 (293). [Oregon State College.]

[327]. 32.91 : 07.7 (672.1). Cermak, F. Contribution à la solution du problème de l'exploitation forestière. [**Contribution to the solution of the problem of forest exploitation [in tropical Africa].**] *Bois For. Trop.* 5 (1), 1948 (27–36 + 6 photos). [F.]

The author first describes the usual methods of extracting logs from African forests by manual labour, goes on to give some account of the American methods of ground skidding, slack-line yarding and tight-line yarding, and discusses the application (actual and potential) of these methods to African conditions with particular reference to Gabon and the use of existing Decauville lines for hand skidding.

[328]. 32.91.12 : 07.7 : 33.02. Silversides, C. R. **Hauling of pulpwood by snowmobile.** Pulp Paper Res. Inst. Can. 1948. pp. 4.

Account of recent experiments in the use of half-track equipment for hauling pulpwood sleighs. The average load hauled was 2·8 cords. It is believed that the cost is a good deal less than that of hauling by horse in the particular conditions of the experiments.

[329]. 32.91.12 : 07.7 : 33.02. **Aluminium pulpwood sleigh.** *Timber of Canada* 8 (9), 1948 (75).

A new aluminium sleigh and rack for hauling pulpwood has been designed by I. L. Kelly of Price Bros. & Co., Chicoutimi, Quebec. The sleigh and rack weigh only 600 lb., can be lifted entirely off the ground by 2 men, and gave a satisfactory performance in a 30-day test, hauling 210 cords of pulpwood over difficult ground.

[330]. 32.91.12 : 33.06. Deasy, J. J. **Note on the extraction of firewood.** *Irish For.* 4 (2), 1948 (63–4).

A note on the construction and use of skidding sleds.

[331]. 32.91.22 : 07.7 (47). Daragan, L. D. Avtomobil'nȳ nizkoramnȳ sannȳ pritsep. [**The truck-drawn, low-built semitrailer sledge.**] *Lesnaya Prom.* 1947 (12), (4–6). [Russ.]

A comparison is made of the features, costs and performances (illustrated by graphs and tables) of the AOS–6 semitrailer sledge, with and without a sledge-pair in tow, and the Pallo low-built semitrailer, the two chief types of transport equipment for single-rutted iced roads in the U.S.S.R. [cf. *For. Abstr.* 9 (No. 2318)], both designed to be hauled by the ZIS–5 truck. Conclusions are drawn regarding the conditions—chiefly trip distance and whether manual or mechanical methods of loading are employed—under which the economic advantage is likely to lie with the one or the other type of equipment.

[332]. 32.91.4 : 07.7 (47). Epifanov, B. Legkie motovozȳ na uzkokoleynȳkh zheleznȳkh dorogakh. [**Light motor locomotives on narrow-gauge railways.**] *Lesnaya Prom.* 1948 (1), (10–14). [Russ.]

An account, with specifications and scale diagrams, of 10 types of light locomotives with internal-combustion engines, mostly driven by gas generator and some on liquid fuels, for use on narrow-gauge railways, and on light Decauville tracks.

[333]. 32.91.4 : 07.7 (47). Voronitsȳn, K. I. Novȳe lokomotivȳ dlya lesnoy promȳshlennosti. [**New locomotives for the forest industry.**] *Lesnaya Prom.* 1947 (11), (7–10).

Detailed specification (with photographs and diagrams) of a type of locomotive (PT–4) now being manufactured for use on narrow-gauge forest railways.

[334]. 32.91.4 : 07.7 (47). Trubetskoy, V. A. Tyagovo-teplotekhnicheskie ispȳtaniya lesovoznogo parovoza serii PT–4–001 kolei 750 mm. [**Tests of traction power and thermal efficiency of the PT–4–001 locomotive for timber transport on 750 mm.-gauge railways.**] *Lesnaya Prom.* 1947 (12), (7–13). [Russ.]

[335]. 32.92–4 (470). Garin, A. A. Osnovnȳe voprosȳ rekonstruktsii kamskogo lesosplava. [**Fundamental problems in the reconstruction of timber-floating on the Kama River.**] *Lesnaya Prom.* 1947 (9), (7–9). [Russ.]

Suggestions are offered on various matters of detail in the rationalization of floating operations connected with the expansion of logging

in the Kama basin. [Cf. *For. Abstr.* 7 (No. 502); 9 (No. 2320).]

[336]. 32.92–4 : 07.7. NEKRASOV, E. M. Nagel'nŷe bonŷ. **[Built-up booms of 'dowelled' construction.]** *Lesnaya Prom.* 1947 (2), (8–10). [Russ.] Pered navigatsiey 1947 goda. **[[Suggestions for] the 1947 floating season.]** *Lesnaya Prom.* 1947 (2), (12–13). [Russ.]

(1) Because of the large annual demand for replacements in river booms for floating operations, the author has made experiments with a view to mass-production of booms built up of standard replaceable parts. These are (*a*) the actual boom sticks, dressed on the upper side and machine-bored at standard intervals, through diameters lying exactly in the same plane, to take (*b*) round or faced wooden pins, 7·5–10 cm. wide, made either by hand or machine from softwood edgings. The pins pass through and unite the required number of boom sticks and are secured by wedges at their ends. This method of construction would enable the preparation and assembling of booms to be concentrated and rationalized at central plants. The method of construction and a suggested lay-out for such a plant are illustrated by diagrams.

(2) The second article mentions that a plant of the type proposed by Nekrasov is being constructed at the Oyatsk floating depot of the 'Lenles' Timber Trust, where it is expected to show considerable savings in labour and costs. Very brief notice is also given to various other equipment for floating operations, including a floating plant for making raft bundles and a floating crane for lifting sunken logs. Both of the latter installations are figured. The Central Timber-Floating Research Institute has constructed a 'hydro-aerodynamic' tank, the first of its kind in the U.S.S.R., for laboratory investigations of floating installations under wind and wave conditions simulating those met with in actual work.

[337]. 32.92–4 : 07.7. [BROET, P.] Radeaux automobiles pour le transport économique des bois. **[Self-propelling rafts for the economic transport of timber.]** *Bois For. Trop.* 5 (1), 1948 (63–71). [F.]

The device here described is covered by two French patents (G2–6—Gl–1—No. 865,900 and G2–6—Gl–1—No. 895,265) dated May 17, 1941 and May 27, 1944, respectively. It consists in constructing rafts of logs or lumber housed in a wooden barge-like framework sufficiently strong to be towed or propelled by marine engines installed in a removable, watertight stern section which can be built into the framework at a convenient stage in its construction. Full details, illustrated by diagrams, are given of the construction of framework and rafts, which can be effected without wharves, floating docks, cranes, etc., on any sheltered, gently sloping beach where the fall of the tide equals at least $\frac{1}{3}$ of the draught of the raft.

[338]. 32.92–4 : 33.02. SILVERSIDES, C. R. **Pulpwood holding grounds.** Pulp Paper Res. Inst. Can. 1948. pp. 51. 48 refs.

The following subjects are dealt with: site and design of holding grounds; forces which act on holding booms; strength and floating properties of boom materials; prolongation of working life of booms; boom couplings and attachments; wire rope; boom designs; piers; anchors and deadmen; piles; choice of safety factors; a proposed method for obtaining tensions within a booming system without the use of dynamometers.

[339]. 32.95 : 07.7. CRESTIN, [F.] Quelques dispositifs simples pour la vidange des coupes par câbles. **[Some simple devices for cable logging.]** *Rev. Bois Appl.* 2 (11), 1947 (8–12). [F.] P.R.

[340]. 32.95 : 07.7. CRESTIN, F. Transport rectiligne, par câbles, de lourdes charges. (Brevets Coupry). **[Rectilinear cable transport of heavy loads. (Coupry patents).]** *Rev. Bois Appl.* 3 (3; 5), 1948 (13–16; 18–19). [F.]

[341]. 32.95 : 07.7. HUBER, A. **New skyline for long distance logging [a description of the Wyssen telpher].** *Timberman* 49 (7), 1948 (78, 80).

[342]. 32.95 : 07.7 (494). SILVERSIDES, C. R. **Wood transportation by gravity cableways in Switzerland.** Pulp Paper Res. Inst. Can. 1947. pp. 5.

Describes, mainly from Swiss sources, the Wyssen and Lasso cableways. [Cf. *For. Abstr.* 9 (Nos. 964–5).]

[343]. 32.95 : 07.7 : 33.02. SILVERSIDES, C. R. **Gravity skidding of pulpwood over suspended wire or cable.** Pulp Paper Res. Inst. Can. 1947. pp. 5.

The information in this report is supplementary to the report published in 1946 [cf. *For. Abstr.* 9 (No. 346)]. It deals chiefly with methods of attaching bolts of wood to the wire, and skidding bundles of pulpwood instead of separate bolts. Many more experiments are needed.

[344]. 32.96 : 07.7. IPPOLITOV, K. Prisposoblenie dlya razgruzki traktornykh saney. **[Apparatus for unloading tractor sledges.]** *Lesnaya Prom.* 1947 (11), (11). [Russ.]

Description (with diagram) of a simply constructed pushing arm, attachable to the rear of a tractor and movable in the vertical direction by means of a hand winch. Shunting backwards and forwards at right angles to a train of timber sledges, the tractor pushes their load into the required position in the stack up to a height of 2·5 m. The apparatus can also be used for getting timber into the water.

[345]. 32.96 : 32.91.4 : 32.26. ZHELUDKOV, A. G. Nizhnie prizheleznodorozhnye skladý mekhanizirovannýkh lesovoznýkh dorog. **[Railhead timber depots served by roads with mechanized transport.]** *Lesnaya Prom.* 1947 (12), (14–17). [Russ.]

Discusses and illustrates by diagrams 3 suggested lay-outs: (1) for a large depot handling up to 500,000 solid cu.m. per season, holding 50,000 cu.m. at a time, and with provision for detailed sorting of wood into 100 categories; (2) for a medium-sized depot handling up to 150,000 cu.m., holding 25,000 cu.m. at a time and with provision for sorting into 40 categories; (3) for a smaller and simpler arrangement, handling up to 150,000 cu.m. but requiring pre-sorting at forest timber depots into 5 categories.

The sequence of operations at each is described.

33. CONVERSION AND PRESERVATION OF WOOD

See also *For. Abstr.* (Nos. 250, 255).

[346]. 33 (48). FOGELHOLM, K.-G. Om strukturella förändringar i nordisk träförädlingsindustri. **[Structural changes in the Scandinavian wood conversion industries.]** *Papp. Trävarutidskr. Finl.* 30 (7A), 1948 (1–4, 39–40). [Sw.e.] P.R.

Discusses and illustrates with graphs the relative changes in importance of the 4 main branches of wood conversion—sawn timber, mechanical pulp, chemical pulp and paper—in Norway, Sweden and Finland during the 20th century.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

See also *For. Abstr.* 10 (No. 309).

[347]. 33.1 : 02.1 : 5 : 32 : 33.9 : 33.36.3 : 34.6 : 07.7 : 82. PRESTIN, M., and HOLTSMAARK, B. Lommebok for sagbruk, høvlerier og trevarefabrikker. **[Handbook for sawmills, and planing and woodworking shops.]** Nasjonalforlaget, Oslo. 1945. pp. 397 + 24 photos. 9 refs. [Nor.] Price: Kr. 12. P.R.

A comprehensive work including chapters on: weights and measures (with conversion tables); timber logging, transport and storage; scaling; sawmills; grading; piling; seasoning; saws; planing machines; moulding machines; saw sharpening; conveyors; motors; use of wood-waste; power stations; electric motors; maintenance; working conditions and insurance.

[348]. 33.1. MALCOLM, F. B. **Fabrication of wood products at small sawmills and woodworking plants.** *Sth. Lumberm.* 176 (2207), 1948 (52, 54, 56, 58). 11 refs. [Forest Products Laboratory, Madison.]

The combined small sawmill and woodworking plant is becoming increasingly important in many parts of the U.S.A. The purpose of this publication is to bring together the very scattered information available on the financing, organization, equipment, and operation of such businesses.

[349]. 33.1 : 07.7. CORTI, M. A. **Tungsten carbide use [for cutting edges] in the woodworking industry.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 4. P.R.

Use of Wastes

See also *For. Abstr.* 10 (Nos. 361, 373, 557, 559–61, 580).

[350]. 33.1 : 34.6. **Sawdust floor-sweeping compounds.** *Sth. Lumberm.* 176 (2205), 1948 (44). [U.S. For. Prod. Lab., Madison.]

33.12. Joinery, Turnery

See also *For. Abstr.* 10 (Nos. 356, 368).

[351]. 33.12 (431–5) : 07.7 : 33.8. BROCKBANK, E., and TYSON, B. **German hand tools industry. Section No. 8. Handles.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 1628 (Section 8), Item No. 31, [*n.d.*] pp. 51. 2 photos. 22 dgms. P.R.

Describes the equipment and methods of 25 firms engaged in making handles, dealing with sawing, rounding, turning, bending and sanding. The chief points of interest were bending and sanding, which are described in some detail. Nearly every plant produced its own power by steam raised from waste wood, chippings and sawdust, and many works had very efficient exhausting plants for drawing the chippings and dust to the power house.

[352]. 33.12 : 07.7. **Portable wood-grooving machine.** *Engineering* 164 (4272), 1947 (570–1). D.S.I.R.

Describes, with illustrations, a power-operated hand tool for grooving, moulding and tenoning operations; it can also be adapted for cross-cut and taper sawing.

33.13. Cooperage. Shingles

See also *For. Abstr.* 10 (No. 590).

[353]. 33.13 : 33.15.2. **Collapsible barrels of laminated wood.** *Aust. Timb. J.* 14 (1), 1948 (26–7).

Description of a collapsible barrel made by the British firm of Merran. It is built of 10 laminated staves, which are resistant to shrinkage and swelling owing to a skilful crossing of the grain of the laminae. For a given capacity all staves and ends are interchangeable. The barrel can be taken apart and reassembled with the greatest ease, so saving valuable freight space.

[354]. 33.13 : 12.26–8 (213). NORMAND, D. Les tuiles en bois tropicaux. [**Roofing shingles of tropical woods.**] *Rev. int. Bois* 15 (131), 1948 (99, 101, 103, 106). [F.]

A short review of the subject.

33.14. Match Manufacture

[355]. 33.14 : 12.25 (47). KROKOS, T. P. Ispol'zovanie sosnȳ v spichechnom proizvodstve. [**Use of Scots Pine for match manufacture.**] *Lesnaya Prom.* 1948 (1), (23–4). [Russ.]

In view of the local overcutting of Aspen near match factories in the U.S.S.R., attention has been turned to conifers, especially Pine [*Pinus sylvestris*], as possible substitutes. The match industry has always claimed that softwood splints are inferior to Aspen in strength, and this claim is substantiated by the author's laboratory tests, the results of which are tabulated, on Pine, Spruce [*Picea abies*?] and Silver Fir [*Abies sibirica*?] in comparison with Aspen. The discrepancy between these results and those of standard strength tests is explained by the small size of the test pieces (splints), owing to which Aspen gains the advantage in strength because of its uniform texture. The critical factor in processing is the strength of the cut splints during insertion into the holes of the dipping machine. It is impracticable to reduce the sectional dimensions of the splints, but further experiments with Pine in the laboratory and at a match factory, have shown that the difficulty can be overcome by: (1) treating the splints in a polishing cylinder with paraffin, which acts as a lubricant during the subsequent insertion process; and (2) reducing the speed of the machine during insertion from 109 to 95 revs./min., thus diminishing breakage of splints (due to impact stresses) from 23–25 to 16–17%.

Research on the use of conifers for this purpose continues.

33.15. Manufacture and Use of Veneers and Laminated Wood. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

[356]. 33.15 (431–5) : 33.12 : 33.8. LEIGH, J. H., KNIGHT, R. A. G., and EMERY, G. A. **Visits to targets connected with the German plywood and wood aircraft industry.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 339, Item Nos. 22, 25, 1945. pp. 10. P.R.

[357]. 33.15 : 33.8. HEEBINK, B. G., and MOHAUPT, A. A. **Investigation of methods of inspecting bonds between cores and faces of sandwich panels of the aircraft type.** *Rep. U.S. For. Prod. Lab., Madison* No. 1569, 1947. pp. 11 + 7 photos, 3 dgms., 5 tbls. P.R.

[358]. 33.15 (73) : 33.91. **Principal government specifications for plywood**

and adhesives. Resinous Products and Chemical Company, Philadelphia, Pa. No. TP–90–11, 1947. pp. 27. 51 refs. P.R.

33.15.1. *Manufacture of Veneers and Laminated Wood*

See also *For. Abstr.* 10 (Nos. 306, 585).

[359]. 33.15.1 (47). Zinov'ev, V. V. Fanernaya promyshlennost' SSSR. [**The plywood industry of the U.S.S.R.**] *Lesnaya Prom.* 1947 (10), (14–15). [Russ.]

A brief review of the history of the plywood industry since its re-establishment in 1921, in which year the 16 factories in partial operation had an output of 21,500 cu.m. Progress was gradual up to the introduction of the 5-Year Plans and then more rapid. At the end of the second Plan (1937) there were 36 factories, with an annual output of 672,300 cu.m. The third Plan envisaged the construction of 12 more factories, but up to the first year of the war only 4 had been built. The last of these is the largest plywood factory in the U.S.S.R., producing 10% of the total output for the country. Under the present Plan the industry is expected to increase its annual outturn by 300,000 cu.m. by 1950, but may be able to reach this target sooner.

[360]. 33.15.1. Topham - Bruckmann, H. C. **Heat demand in veneer factories.** *Timber News* 56 (2104; 2105), 1948 (74–5; 118).

Considers generally the heat requirement in veneer factories for (1) boiling and steaming the logs and (2) artificial drying of veneers and, taking a specific case, calculates the equipment and heat costs for a small factory with one rotary veneer-peeling lathe and one horizontal slicer with an assumed output of 100 cu. ft. wet veneers per hour.

[361]. 33.15.1 : 07.7 : 34.6 : 33.1. Colucci, G. **Special machines for utilization of waste slabs for glued core stock.** *Sth. Lumberm.* 176 (2208), 1948 (59–60).

[362]. 33.15.1 : 12.25. Pearson, C. H. **Technical aspects in Douglas Fir plywood manufacture.** *For. Cl. Quart.* 21 (2), 1947–8 (9–13).

Observations on moisture-content control and hot-pressing of veneers.

[363]. 33.15.1 : 31.0 (88) : 33.12 : 12.26–8. Spoon, W. Surinaamsch hout voor fineer en triplex. [**Surinam timber for veneer and plywood.**] *Ber. HandMus. kolon. Inst. Amst.* No. 191, 1942. pp. 8 + 3 photos. 12 refs. [Du.]

Describes the results of peeler tests on 3 species—Baboen (*Virola* spp.), Possentrie (*Hura crepitans*) and Soemaraepa (*Simarouba* spp.). All 3 woods are considered suitable for furniture manufacture.

[364]. 33.15.1 : 31.0 (91) : 33.6. Spoon, W. Indische houtsoorten voor fineer en triplex. [**Species for veneer and plywood from the Netherlands Indies.**] *Ber. HandMus. kolon. Inst. Amst.* No. 193, 1943. pp. 19. 18 refs. [Du.]

Discusses the use of different species in the East Indies for packing cases for the export of rubber and tea; also the results of sawing and peeler tests carried out on 13 species in factories in Holland and the Netherlands Indies.

[365]. 33.15.1 : 12.26–8 : 31.28 : 31.41. Notes sur la conservation et l'usinage de l'Ilomba (*Pycnanthus kombo*). [**Notes on the preservation and working qualities of *Pycnanthus kombo*.**] *Bois For. Trop.* 5 (1), 1948 (84–5). [F.]

Two logs of Ilomba from Cameroun were investigated at Nogent. Sliced veneer $\frac{6}{10}$ mm. thick and rotary-cut veneer 1 mm. thick were easily obtained and of good quality. It was found that veneer or planks were naturally fairly durable but that logs in the round were soon attacked by fungi.

[366]. 33.15.1 : 12.29 : 31.27. Yee, C. F., Lo, C. H., and Hwang, C. B. **Plybamboo.** *Tech. Rep. Bur. aeronaut. Res., Chengtu* (now *Nanchang, Kiangsi*). No. 26, 1945. pp. 52. [Chin.]

A detailed account of the method of manufacture, and strength and durability of Bamboo plywood, as produced in China during World War 2, to meet the demand for aircraft materials. Plybamboo consists of woven Bamboo sheets glued together in much the same way as plies of wood.

Species of Bamboo used. Chiefly *Bambusa textilis* var. *maculata* (*tsingpichu*), grown in Kwangtung and *Sinocalamus affinis* (*tzuchu*) grown in Szechuan.

Selection of culms. Straight, long-internoded culms, 3 to 4 years old, are preferred.

Splitting and stripping. The culms are cross-cut (sawn) to the desired length, then cleft longitudinally into splints some 5–6 mm. wide and the thickness of the culm wall. Only the *chutsing* or outer green layer of this wall, approximately 30% of its whole thickness, is used (because stiffer and stronger), a tool like a draw-knife being employed to separate it from the rest. This *chutsing* portion is then trimmed to the width desired and split tangentially into two strips of the thickness desired.

Weaving the sheet. The strips so prepared are generally woven by hand, although a small machine has been tried with some success. The weave most used consists of one weft passing over and under two warps.

Types of assembly. The most common kinds are 2- and 3-ply (seven of which are illustrated diagrammatically), either all of Bamboo or bonded with a core or 2 faces of plywood. The Bamboo sheets are assembled in various combinations of the set of their pattern or weave.

Gluing. Shortage of synthetic resins has necessitated the use of casein glues. The pressures applied in assembling are 150 to 200 lb./sq. in.

Properties and use. Besides possessing the general advantages of plywood, plybamboo has proved stronger and it can be moulded to certain shapes. Its strength properties are greatly influenced by different combinations of the set of the weave, which can be adapted to the particular purpose in view. It has been successfully employed in aircraft construction, with a moisture-proof coating. When synthetic-resin glues can be used, along with machines for splitting and weaving, a big future seems indicated for plybamboo in Chinese industries.

[367]. 33.15.1 : 33.15.5. JABLONSKY, B. **Articles of bonded wood laminae.** *Brit. Patent* No. 591,479, Aug. 19, 1947. *Abstr.* in *Timber News* 56 (2106), 1948 (159).

A method of making articles of bonded wood laminae having curved or shaped surfaces, from interlaced or interwoven strip-like wood laminae, by bonding with a suitable adhesive and simulataneously shaping under pressure or pressure and heat. The invention is applicable to the production of shoe-trees, travelling cases, trunks, etc., or of industrial parts—e.g. bodies for cars and boats, and covering plates for aircraft. The radii of the curvatures, it is claimed, can be smaller than those hitherto used for pressed articles of laminated wood.

[368]. 33.15.1 : 12.25 : 31.27 : 33.12. TURNER, N., and WEBSTER, C. **The effect of method of conversion, i.e. sawn or sliced, on the limiting radii of curvature of Sitka Spruce laminae.** *Scientific and Technical Memorandum, Ministry of Supply, London* No. 31/46–FP32 RIS38, 1947. [Forest Products Research Laboratory, Princes Risborough.] P.R.

It is concluded that if the 'loose face' of sliced laminae is in tension, the limiting radii will be much greater than for sawn laminae; with the 'loose face' in compression, the difference between sawn and sliced appears negligible, but in practice it is unlikely that time could be spent in determining which is the 'loose face'. No consistent results were obtained in tests made to compare the limiting radii of curvature of untreated sawn material with matched sawn material that had been subjected to a softening treatment similar to that of sliced laminae.

[369]. 33.15.1 : 11.11 : 31.27 : 12.25. HIGGINS, H. G., and GRIFFIN, F. V. **The nature of plastic deformation in wood at elevated temperatures.** *J. Coun. sci. industr. Res. Aust.* 20 (3), 1947 (361–71). *Repr. For. Prod. Aust.* No. 99.

(1) Elastic after-effects were observed in Hoop Pine plywood panels which had been oven-dried and subjected for five minutes to pressures capable of causing residual deformation at elevated temperatures. (2) For the major residual deformations observed, elastic after-effect comprised about half of the total residual deformation at a pressing temperature of 120° C., a proportion which declined to one-seventh at 200° C. (3) The influence of elastic after-effect was such as not to alter radically the effect of temperature upon yield-value. (4) Microscopic studies showed that the radial pressure required to produce fracture of the cell wall declined with increase in temperature, the effect being linear over the range examined, with a regression coefficient of – 6·75 lb./sq. in. per degree C. (5) From a consideration of temperature and pressure effects, three main zones of deformation could be defined: those of elasticity, flow, and fracture. The zone of

flow was divisible further into areas of plasto-elasticity and visco-elasticity. (6) It appeared probable that the location of flow in the wood tissue was the cell wall as well as the middle lamella zone. (7) Deformation in the zone of flow appeared to involve re-arrangement on a sub-microscopic scale, in so far as gross fracture of the cell wall was absent, and minute compression failures were not significantly more abundant than in the zone of elasticity. (8) Rheological studies may contribute to the knowledge of the structure of the cell wall. Short loading times and elevated temperatures should be used in conjunction with sustained loading at ordinary temperatures. *Authors' summary.* [Cf. *For. Abstr.* 9 (No. 2363).]

[370]. 33.15.1 : 33.15.5. LEKTORSKI, D. H., BABOCHKIN, P. N., and GRACHEV, I. D. **A new kind of water-resistant plywood.** [Novÿ vid vodostoykoy fanerÿ.] Foreign Journal Service, Coun. sci. industr. Res. Aust. [*n.d.*] pp. 14. 10 refs. *Transl.* from *Lesnaya Industriya* 1943 (7/8), (17–20). P.R.

[371]. 33.15.1. GEEN, H. C. (to Haskelite Manufg. Corp.). **Adhesive tape and method of use in plywood.** *U.S. Patent* No. 2,420,366, May 13, 1947. *Chem. Abstr.* 41 (16), 1947 (5344). P.R.

[372]. 33.15.1 : 33.36. WELCH, A. R. **Coated plywood.** *U.S. Patent* No. 2,419,614, Apr. 29. 1947. *Abstr.* in *Mod. Plastics* 25 (2), 1947 (164). P.R.

A layer of a mixture of synthetic resin and wood particles is applied to a plywood panel, of which at least one outer ply has cracks and other imperfections on its outer surface. The layer, which is cured by heat and pressure, should be thick enough to fill the cracks while forming a smooth outer surface.

[373]. 33.15.1 : 34.6 : 12.26–8. BURKHART, R. L. **Interior trim from wood waste.** *Sth. Lumberm.* 176 (2211), 1948 (48, 50). Also in *Wood Prod.* 53 (4; 5), 1948 (48–9; 44, 46).

Description of a method of manufacturing moulded interior woodwork for houses, with a veneer face and a core of wood-waste derived from veneer manufacture. It is concluded that this is a practical use for such wood-waste, provided that plenty of hardwood waste is available, face veneer is available at manufacturing cost, and the design is such that frequent changes of die are not necessary.

33.15.2. *Use, Strength and Durability of Plywood and other Laminated Wood*

See also *For. Abstr.* 10 (Nos. 353, 530, 532, 568, 582, 584–6, 592, 649–50, 652).

[374]. 33.15.2 : 31.27. HEARMON, R. F. S., and SEKHAR, A. C. **The frequency of vibration and the deflection under concentrated load of rectangular plywood plates.** For. Prod. Res., Lond. 1947. pp. 11 + 1 tbl. + 2 dgms. + 53 gphs. 9 refs.

Results are given for plates cut at various grain angles and conclusions of an earlier investigation [see *For. Abstr.* 8 (No. 1111)] into the frequencies of 0°–90° plates confirmed, though some numerical results have been modified. The theoretical equations for the frequencies and deflections are strictly valid for 0°–90° plates only, but they can be used at other angles provided that the elastic constants are first transferred to the appropriate angle. The effect of grain angle on the frequencies and deflections is small or negligible for square plates and is appreciable, though not large, for oblong plates having the ratio of sides about 1·5 : 1. The empirical method of predicting the frequencies in terms of plate dimensions only, used earlier on 0°–90° plates, is applicable at all angles, and an analogous method is shown to be applicable to the deflections also. *From authors' summary.*

[375]. 33.15.2 : 31.27 : 31.21.3 : 12.25. KINGSTON, R. S. T. **The variation of tensile strength and modulus of elasticity of Hoop Pine veneer with the direction of the grain.** *J. Coun. sci. industr. Res. Aust.* 20 (3), 1947 (338–44). 8 refs. P.R.

Veneer of Hoop Pine (*Araucaria cunninghamii*) was tested in tension at various angles to the grain and the maximum tensile strength and modulus of elasticity were determined. The variation of these two strength properties with the direction of the grain is illustrated by curves.

A comparison of these experimental curves with a theoretical curve based on the assumption that wood is an orthotropic material, in the case of modulus of elasticity, and with a curve

computed from the Hankinson formula, in the case of maximum tensile strength, show no significant differences. *From author's summary.*

[376]. 33.15.2 : 31.27. MANN, E. H. **The mathematical treatment of stress concentration in plywood.** *Rep. Div. Aeronaut. Coun. sci. industr. Res. Aust.* No. SM.90, 1947. pp. 28. 23 refs. P.R.

States, without proof, the fundamental equations of the elastic behaviour of plywood, and describes the main methods of solving problems of stress concentrations. Gives particular attention to the methods which use conformal transformations to simplify the problem and discusses the practical advantages of this approach. *From author's summary.*

[377]. 33.15.2 : 31.27. FREIBERGER, W. **The buckling of flat plywood panels. A summary of theoretical work.** *Rep. Div. Aeronaut. Coun. sci. industr. Res. Aust.* No. SM.99, 1947. pp. 60 + 16 gphs. 33 refs. P.R.

[378]. 33.15.2 : 31.27. KUENZI, E. W., and NORRIS, C. B. **Torsional buckling of longitudinally stiffened, thin-walled, plywood cylinders.** *Rep. U.S. For. Prod. Lab., Madison* No. 1563, 1948. pp. 6 + 2 dgms., 2 gphs., 1 tbl. P.R.

The results of torsion tests performed at the Forest Products Laboratory on stiffened, thin-walled plywood cylinders showed that the buckling stress of the portion of the shell between the stiffeners is about 85% of the buckling stress of an unstiffened cylinder of the same curvature and thickness. The cylinders tested were about 0·04 in. thick, were curved to a 9-in. radius, and had 11 to 28 longitudinal stiffeners, $\frac{1}{32}$ to $\frac{1}{2}$ in. thick, glued to the inner surface. The theoretical buckling torque of an unstiffened cylinder of the same weight and curvature as a stiffened cylinder was found to be greater than that for the stiffened cylinder. *Authors' summary.*

[379]. 33.15.2 : 33.8 : 31.27. KEYLWERTH, R. **Experiments on pin pressure in laminated wood, plywood and multiply-wood used in aircraft construction.** *Transl. Minist. Supply* No. GDC 10/12052T(D). From *Technische Berichte* 11 (2), 1944 (41–7 + 3 dgms., 3 gphs., 5 tbls.). P.R.

Measurements of pin pressure in bolted connections of wooden parts in laminated wood and plywoods, for different directions of stress, were made to enable design standards to be set up. The test conditions assumed side pressure in a hole by a 10-mm. stiff bolt, without strap friction or impediment to lateral spread.

[380]. 33.15.2 : 31.27 : 33.15.3 : 33.8. SANBORN, W. A., GOODELL, H. R., ELY, A. W., and PHILLIPS, R. S. **Bolt-bearing strength of wood and modified wood. Bearing strength of wood members reinforced with plywood and cross-banded compreg under single and multiple aircraft bolts.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1523–D, 1946. pp. 20 + 4 photos, 4 dgms., 15 gphs., 10 tbls. P.R.

[381]. 33.15.2 : 31.22 ; 31.8. CARRUTHERS, J. F. S. **Moisture relations of composite wood products. Progress report 17. The cracking of decorative veneer laid on plywood.** For. Prod. Res., Lond. 1948. pp. 6 + 2 + 6 tbls. P.R.

Experiments at different moisture contents showed no cracking when the grain direction of the decorative veneer was laid at right angles to that of the surface veneer of the plywood. When their grains were laid parallel, cracking did not occur at a moisture-content range of 20–12%, but did occur at a range of 12–4%. A rapid reduction of moisture content to below 12% is less likely to cause cracking than a slow one. The moisture content of the plywood determines the extent of cracking. Cracking is more severe in panels made with hot- than with cold-setting glues. The extent of cracking is also influenced by the species of the underlying plywood, Scots Pine being the most conducive to cracking of the 5 species tested. Other variables which may influence cracking—e.g. thickness of veneer and plywood and the type of adhesive used—will be the subject of further experiments.

33.15.3. *Improved Woods*

See also *For. Abstr.* 10 (No. 380).

[382]. 33.15.3 : 31.3. JAHN, E. C. **Chemically modified wood.** *Svensk Papp Tidn.* 50 (17), 1947 (393–400). 61 refs. [E.g.sw.] [N.Y. State College of Forestry, Syracuse Univ.] L.S.

A review of recent literature.

[383]. 33.15.3. MILLETT, M. A., and STAMM, A. J. **Wood treatment with urea resin-forming systems (comparison with phenolic resins for making compreg).** *Mod. Plastics* 24 (6), 1947 (159–60, 208, 210, 212). 3 refs. P.R.

Describes experiments on compreg, using matched panels of Cottonwood veneer impregnated with urea-formalin, dimethylolurea and water-soluble phenolic resins. Results (expressed in graphs and tables) show that (1) only about ½ as much pressure was needed with phenolic resins as with urea resins, and (2) phenolic resins gave superior dimensional stability.

[384]. 33.15.3 : 31.27. WARR, J. **The strength of compreg wood.** *Chem. Note Roy. Aircr. Estab., Farnborough* No. 901, 1945. pp. 12 + 1 photo, 2 dgms., 16 gphs. P.R.

Describes tests on 2 proprietary brands of compressed and impregnated wood, 'Hydulignum' and 'Jablo'. Samples from current production were tested in compression, tension and shear and the results analysed statistically to provide a basis for design stresses. *From author's summary.*

[385]. 33.15.3 : 31.27. PADDON, T. W. **High density laminates.** *Timber News* 56 (2106), 1948 (135–6, 139). 1 ref.

Discusses the theory and practice of high-density laminating and its effect on materials treated, and lists and tabulates the results of strength tests on certain species found especially suitable for treatment.

[386]. 33.15.3 : 33.31 : 31.2 : 12.26–8. GENEL', S. V. Snizhenie gigroskopichnosti drevesinȳ obrabotkoy ee rasplavlennȳmi aromaticheskimi aminami. **[Reducing the hygroscopicity of wood by treatment with liquefied aromatic amines.]** *Lesnaya Prom.* 1948 (1), (18–23). [Russ.]

After preliminary trials, made with Birch veneer and small samples of Beech, which showed that immersion in liquefied diphenylamine, α-, or β-naphthylamine at 130° C. for 1 hour, was the most suitable treatment as regards absorption, strength values and moisture-proofing effect, larger-scale trials were made with small samples [size unspecified] of aircraft-grade Beech impregnated under these conditions with the same three amines. Conditions of the subsequent tests, including sizes of test pieces, are specified. Properties examined were specific gravity; moisture uptake (at 18 ± 2° C. and 75 or 92% relative atmospheric humidity) and water uptake, both over a period of 40 days; compression and tensile strengths parallel to the grain; static bending perpendicular to the grain, radial shear, and impact bending perpendicular to the grain. Controls and treated samples for the mechanical tests were kept at 45–50% relative humidity and 20 ± 2° C. until they reached practically constant weight, their moisture contents at testing time being: controls 10%, α-naphthylamine 2%, β-naphthylamine 4% and diphenylamine-treated 6%. Results are shown in tables and graphs.

The mechanical tests—both the preliminary ones on Birch and Beech and the more extensive series on Beech alone—indicated β-naphthylamine as the most suitable impregnant. This treatment raised the average specific gravity from 0·67 to about 1·1; decreased moisture uptake in 40 days at 75% relative humidity from 14 to 5%, and at 92% humidity from 22·5 to 13%; decreased water uptake over the same period from 150 to 32%; reduced volumetric swelling by 7–10 and linear swelling by 3–5 times as compared with controls; and improved the various strength values by 25–90% with little alteration of the 'coefficient of quality' (ratios of these values to specific gravity).

Similar results were obtained, but are quoted in less detail, for Birch subjected to the same treatment. These confirm the superiority of β-naphthylamine over the other two amines.

The amines completely protected the wood against three test fungi (*Chaetomium*, *Verticillium* and *Alternaria*).

Further work is needed to determine suitable treatments using β-naphthylamine for other species of timber.

[387]. 33.15.3 : 31.44 : 33.36. BESCHER, R. H. **Acid-proofing of wood.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 4. P.R.

The use of wood in chemical industries is being maintained by improving its chemical resistance to destruction by acid and corrosive fumes through impregnation with phenol-formaldehyde or bituminous resins. Processes for impregnating the wood, its characteristics and uses are given, with laboratory data on

resistance to HCl and H_2SO_4. *From author's summary.* [Cf. *For. Abstr.* 10 (No. 523).]

33.15.4. *Laminated Materials other than Wood*

[388]. 33.15.4 : 31.27 : 33.8. EICKNER, H. W. **Tensile strength at elevated temperature of glued joints between aluminium and end-grain Balsa.** *Rep. U.S. For. Prod. Lab., Madison* No. 1548, 1946. pp. 5 + 3 photos, 6 gphs., 2 tbls. P.R.

33.15.5. *Glues and Gluing*

See also *For. Abstr* 10 (Nos. 495–8, 586, 649).

[389]. 33.15.5. BROUSE, D., and BLOMQUIST, R. F. **Postwar developments in woodworking glues.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 13. 8 refs. P.R.

[390]. 33.15.5 : 07.7. BROWN, G. H., HOYLER, C. N., and BIERWIRTH, R. A. **Theory and application of radio-frequency heating.** D. van Nostrand Company, Inc., 250 Fourth Avenue, New York. 1947. pp. 364. 64 refs. P.R.

Contains a chapter on heat-flow problems in wood-gluing presses (pp. 234–63).

[391]. 33.15.5 : 01.4 : 33.15.1 : 33.36.3. MACALUSO, F. L. **Radio-frequency heating in the woodworking industry.** *Trans. Amer. Soc. mech. Engrs.* 70 (4), 1948 (385–91). 1 ref. P.R.

Cf. *For. Abstr.* 10 (Nos. 543–4).

[392]. 33.15.5 : 07.7 : 33.8. **Repairing shuttles by R.F. heating.** *Timber News* 56 (2105), 1948 (107).

[393]. 33.15.5 : 07.7. **Edge glued by machine.** *Mod. Plastics* 25 (2), 1947 (138–9). P.R.

Describes with illustrations a new edge-gluing machine which will handle a production of 1,000 ft. per hr. in widths up to 37 in., using commercial urea-formaldehyde glues.

[394]. 33.15.5. OLSON, W. Z., and BLOMQUIST, R. F. **Development of strength in Yellow Birch lap joints glued with six resorcinol-resin glues at temperatures from 40° to 80° F.** *Rep. U.S. For. Prod. Lab., Madison* No. 1565, 1947. pp. 4 + 1 photo, 1 dgm., 6 gphs., 3 tbls. P.R.

[395]. 33.15.5 : 33.15.2 : 31.27 : 33.8. OLSON, W. Z., and BLOMQUIST, R. F. **Durability of plywood joints made with one melamine-, one urea-, and five resorcinol-resin glues.** *Rep. U.S. For. Prod. Lab., Madison* No. 1568, 1947. pp. 3 + tbls. P.R.

[396]. 33.15.5. PERRY, T. D. **Durability of urea-formaldehyde adhesives.** *Mod. Plastics* 25 (7), 1948 (88–91). P.R.

[397]. 33.15.5 : 31.46. BERGIN, E. G., and WAKEFIELD, W. E. **The effect of high temperatures on casein cements and cold-setting urea-formaldehyde resin glues. Exposure tests on gap joints.** *Mimeo. For. Prod. Lab., Can.* No. 112, 1945. pp. 13 + 2 dgms., 4 gphs., 5 tbls. P.R.

[398]. 33.15.5 : 31.27 : 31.4. COCKRELL, R. A., and BRUCE, H. D. **Effect of thickness of glue line on strength and durability of glued wood joints.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1616, 1946. pp. 7 + 1 dgm., 58 gphs., 2 tbls. P.R.

[399]. 33.15.5 : 31.46 : 07.2. TRUAX, T. R., and SELBO, M. L. **Results of accelerated tests and long-term exposures on glue joints in laminated beams.** *Trans. Amer. Soc. mech. Engrs.* 70 (4), 1948 (393–400). P.R.

The accelerated tests consist of the application of vacuum and pressure during soaking, in alternate soaking and drying cycles lasting 21 days, to induce extreme shrinking and swelling; comparison with results of tests using a 180-day soaking and drying cycle, and long-term exposures to weathering, shows that the accelerated method is satisfactory.

[400]. 33.15.5 : 31.27 : 33.12. SELBO, M. L. **Shear strength and accelerated durability tests on glue joints in laminated Red Oak beams applicable to such uses as truck bodies, wagons, and implement parts.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1686, 1947. pp. 8 + tbls. + gphs. + plates. P.R.

[401]. 33.15.5 : 31.42. **The effects of micro-organisms on adhesives.** *Bull. Aero-Res., Duxford* No. 62, 1948. pp. 9. 6 refs. P.R.

33.16. Wood-wool (Excelsior) Manufacture. Woodflour

See also *For. Abstr.* 10 (No. 459).

[402]. 33.16. DAHL, W. S. **Woodflour.** Mercury Press, Northampton. 1948. pp. 119. 12 refs. P.R.

Contains sections on: The raw material; uses of woodflour; manufacture of woodflour; and lignin plastics.

[403]. 33.16 : 33.32.4 : 34.6. REINEKE, L. H. **Wood flour.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–9, 1947. pp. 18. 28 refs. P.R.

33.17. Sawmilling

[404]. 33.17 (47). GUTERMAN, M. N. Ratsional'noe ispol'zovanie drevesinȳ pri raspilovke na lesopil'nȳkh zavodakh. **[Rational utilization of timber in conversion at sawmills.]** *Lesnaya Prom.* 1947 (11; 12), (17–21; 21–3). [Russ.]

Considers the many factors affecting the yield of sawn goods from sawlogs, with special reference to the great variation in individual logs and consignments arriving at the mills, the wide variety of sizes and grades of sawn timber demanded by consumers, and the equipment and organization of the mills. Concludes that a great deal of research is needed on these questions, and that: (1) the aim must be to produce the right categories of timber in the right proportions; (2) a wide range of sawn products is more economic than specialization in the manufacture of a few categories only; (3) the best yields, as regards both quantity and quality, are obtained by slabbing off the logs before sawing up, though in special circumstances (e.g. the conversion of crooked logs) sawing 'through and through' is justifiable; (4) frame-saw schedules must be properly planned to suit the timber being handled; (5) great efforts should be made to see that incoming logs are sorted by size, quality and species and that (6) the flow of work is rational; (7) domestic consumers' specifications, at present wasteful, should be modified; and (8) wet storage of logs before, and preservative treatment of timber after sawing, should be introduced wherever possible.

[405]. 33.17 (481 : 73). GULOWSEN, K. T. **Norwegian and American sawing compared.** With comments by D. M. Fisher, B. L. Grondal, and H. Hessler. *W. Cst. Lumberm.* 75 (3), 1947 (99, 101–2).

The Norwegian method consists in sawing double-thickness boards green and resawing with a very thin kerf when dry. The American system is to saw boards green, dry them and then plane them. The Norwegian writer claims that the Norwegian method results in a 15% saving of material. The American writers in their comments argue (1) that higher American labour costs would make it uneconomic; (2) that Douglas Fir (the species under discussion) is not suited to this method, since it is difficult to resaw when dry; (3) that the large size of the West Coast Douglas Fir logs and the need to manufacture graded lumber make it impracticable.

[406]. 33.17 (485) : 07.7. FLODMAN, B., and RIBENDAHL, E. Redogörelse för inventering rörande behandlingen av ram- och cirkelsågblad vid en del svenska sågverk år 1945. **[Report on a survey of the management of frame and circular saw blades at a number of Swedish sawmills in 1945.]** *Medd. Svenska TräforsknInst. (Trätekn. Avd.)* No. 15, 1948. pp. 8. [Sw.sw.] P.R.

Discusses the tabulated results of the survey, which include information on the dimensions and shape of the saw teeth and the speeds used, and concludes that very little uniformity exists in the methods used by different mills.

[407]. 33.17 : 07.7. **Sawmill engineering issue.** *W. Cst. Lumberm.* 75 (1), 1948 (55–142).

[408]. 33.17 : 07.7. DAVIS, E. M. **Woodworking machines.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1706, 1948. pp. 9. P.R.

[409]. 33.17 : 07.7. TOPHAM-BRUCKMANN, H. C. **The theory and practical application of vertical log frame-saws.** Institution of Mechanical Engineers, London. [1948]. pp. 12 + 12 photos. P.R.

[410]. 33.17 : 07.7. HEWLETT, W. D. **The small log gang sawmill as a factor in our present-day utilization problem.** *Sth. Lumberm.* 176 (2099), 1948 (90, 92, 94–5). **Gang saws help solve small log problem.** *Timber of Canada* 8 (9), 1948 (36–7, 88, 91–2).

General accounts of the operation of the frame or gang saw for converting small logs,

and the output, recovery, and costs of such installations.

[411]. 33.17 : 07.7. JOHNSON, R. C. **Small sawmill improvements: a progress report.** Department of Economic Development, Lansing, Michigan. 1947. pp. v + 20.

Covers the following subjects: sawmill scale (index) board [cf. *For. Abstr.* 8 (No. 2146)]; air dogs for small mills [cf. *For. Abstr.* 9 (No. 1061)]; lead indicating device for circular mill headrigs [cf. *For. Abstr.* 9 (No. 1060)]; rapid lead adjusting device; fully automatic swing slab saw; air setworks for small sawmills.

[412]. 33.17 : 07.7 : 12.26–8. TELFORD, C. J., and MALCOLM, F. B. **Milling of Aspen into lumber.** *Lake St. Aspen Rep.* No. 4, 1947. pp. 9.

Studies were made by the Forest Products Laboratory, Madison, on 4 different types of equipment for milling Aspen [*Populus tremuloides*]: (1) portable single circular saw, (2) portable gang circular saw, (3) round log sash gang saw, and (4) splitter and horizontal resaw. Comparative performance is summarized, with a brief discussion of other types of sawmill developed or in process of development.

[413]. 33.17 : 07.7 : 33.52. **The mobile mill.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 2 (7/9), [1947]. pp. 5.

A description of the New South Wales Forestry Commission's mobile sawmill for converting logs to sleepers. While being transported the mill measures 24 ft. in length, 8 ft. in width and 11 ft. in height. For transport by rail, the axles may be removed from the road wheels and a reduction of 1 ft. in height obtained. The breaking-down unit consists of Canadian saws and has a 48-in.-diameter 8-gauge lower saw, driven by 4 rubber vee belts $1\frac{1}{4}$ in. wide, and a 36-in.-diameter 6-gauge upper saw driven by 5 rubber vee belts $\frac{7}{8}$ in. wide, both saws having a peripheral speed of 10,000 ft./min. The log carriage is 6 ft. long but can be lengthened at short notice. The log-carriage drive is provided by means of bevelled ferrobestos cones acting on cast-iron plates which produce a forward drive of 10 ft./min. and a return drive of 30 ft./min. It is hoped to replace this in the near future by a variable-speed drive giving a rate of feed of 15 to about 250 ft./min. The breast bench is equipped with a 36-in.-diameter 10-gauge saw driven by four rubber vee belts $\frac{7}{8}$ in. wide. The breast-bench friction drive consists of an 8-in.-diameter ferrobestos friction wheel 1 in. thick, in contact with the face of a 16-in.-diameter cast-iron plate. The power unit is an automotive type 85-h.p. A.E.C. diesel engine running at a governed speed of 1,850 r.p.m. Brief instructions for preparing the site, towing, placing and operating the mill are given. The experimental mill set up in the Tanban forest has an output of about 2,500 super ft. per 8-hr. day, but a target of 3,000 super ft. per day has been set in order to cover the present cost of working.

[414]. 33.17 : 07.7. **New shadow line guide.** *W. Cst. Lumberm.* 75 (1), 1948 (66).

A new shadow-line indicator to be installed on sawmill edgers, with individual line and shadow bar for each saw, designed by G. W. Horsthotte, Shevlin-Hixon Co., Bend, Oregon.

[415]. 33.17 : 12.25 : 33.91. MATSON, E. E. **Lumber grade recovery from Southern Interior Oregon type Douglas Fir.** *Timberman* 49 (6), 1948 (50, 52, 54, 56, 58, 60, 62).

33.3. *Chemical Treatment*

[416]. 33.3 : 31.3 : 01.6. YORSTON, F. H. **Recent advances in the chemistry of wood.** *Pulp Paper Mag. Can.* 49 (3), 1948 (310, 312, 314). 38 refs.

Reviews publications which appeared during the year ending October 1947.

Use of Wastes

See also *For. Abstr.* 10 (Nos. 446, 463, 565–6).

[417]. 33.3 : 34.6 : 34.24 : 07.7. ANDERSON, T. C. **Disposal of wood refuse at Thunder Bay Paper Co. Ltd., Port Arthur, Ontario.** *Pulp Paper Mag. Can.* 49 (3), 1948 (129–32).

Description of an installation, consisting essentially of a bark press and shredder, for dealing with pulpmill waste and converting it into a form suitable for burning in the furnaces. The installation has made a saving in fuel equivalent to 10–19 tons of coal a day.

[418]. 33.3 : 34.6 : 07.7 : 34.24. La presse à écorce. **[The bark press.]** *Rev. int. Bois* 15 (127), 1948 (12). [F.]

A short account of a device developed in Norway, whereby bark is carried from the

hydraulic barker to a press which compresses and dehydrates it to a moisture content of about 50 per cent., at which it is readily combustible.

[419]. 33.3 : 34.6 : 07.7 : 34.24. SNODGRASS, M. H. **Modern bark burning.** *Paper Tr. J.* 125 (26), 1947 (43–5). P.R.

Describes with illustrations a furnace, in use for over a year, adapted to burn either bark or coal fuel.

[420]. 33.3 : 34.6 : 31.3. SULLIVAN, V. A., and PALMER, G. D. **Lignin—prodigy of the plant kingdom.** *J. chem. Educ.* 24 (10), 1947 (502–4). 23 refs. D.S.I.R.

Discusses methods of isolating lignin, its chemical structure (summarizing the theories of different research workers), and its present uses and the possibility of extending them.

[421]. 33.3 : 34.6 : 11.47.1. DUNN, S., and SEIBERLICH, J. **Uses of lignin in agriculture.** *Mech. Engng.* 69 (3), 1947 (197–8, 212). 9 refs. D.S.I.R.

Evidence indicates that a large part of humus is derived from lignins or is lignin in modified form. This indicates the desirability of experiments to determine the effect of industrial lignins on soil and plants. Experiments were on 2 lines: (*a*) soil cultures; and (*b*) water and sand cultures, to which small amounts of lignin were added. In the case of (*a*), potatoes and onions showed some improvement over the controls, but radishes, peas, beans and lettuces showed none. In the case of (*b*), plants showed better growth in sand cultures treated with lignin than untreated controls, but no differences in water cultures. Other experiments using waste sulphite liquor in irrigation water were inconclusive. [Cf. *For. Abstr.* 8 (Nos. 402, 2546).]

[422]. 33.3 : 34.6 : 33.32.4. SEIBERLICH, J. **Utilization of lignin by zinc salt treatment.** *Chem. Industr.* 56 (1), 1945 (53). 2 refs. D.S.I.R.

Compares the water absorption of lignin treated with $ZnSO_4$ with untreated lignin, with Na_2S_4-treated lignin, and with other plastics.

[423]. 33.3 : 34.6. **Turpentine recovery in pulp mills.** *Sth. Pulp Paper Mfr.* 11 (2), 1948 (52, 56, 57).

[424]. 33.3 : 34.6 : 12.25. KRESS, O. **By-products from the kraft pulping of Pine woods.** *Pulp Paper Mag. Can.* 49 (3), 1948 (166–8, 177).

Two valuable by-products are obtained from the kraft pulping of the various species of Pine. Tall oil is prepared from the so-called skimmings obtained from black liquor, and turpentine is recovered by condensation from the relief gases during the actual digestion of the wood. The methods of obtaining and refining these substances are described and analyses given of both crude and refined tall oil.

[425]. 33.32.1 : 34.6 (431–5). WORNUM, W. E., and ANNAND, D. L. **Tallöl: its processing and utilization in Germany.** *Final Rep. Brit. Intell. Obj. Sub-comm.* No. 536, Item No. 22, 1946. pp. 9. P.R.

[426]. 33.3 : 34.6. ENKVIST, T. Fytosterin i talloljebeck. [**Phytosterol in tall-oil pitch.**] *Svensk PappTidn.* 50 (15), 1947 (351–3). 12 refs. [Sw.g.e.] [Svenska Träforskningsinstitutet, Träkemiska avdelningen.] L.S.

Manufacture of phytosterols from tall-oil pitch appears to be possible. Differences in the content of sterols in pitch from different mills are probably caused by differences in conditions of distillation, e.g. temperature, duration of heating, and possibly pressure. Serious destruction of esterified sterols was found to begin at about 270° C. [Cf. *For. Abstr.* 8 (p. 464); 9 (No. 1714).]

[427]. 33.3 : 34.6. ENKVIST, T. Undersökningar rörande talloljebeck. [**Investigations on tall-oil pitch.**] *Svensk PappTidn.* 50 (16), 1947 (363–9). 14 refs. [Sw.g.e.] [Svenska Träforskningsinstitutet, Träkemiska avdelningen.] L.S.

Reports on analyses of the pitch from various mills, sizing experiments with various fractions isolated from the pitch, and distillation experiments at pressures of ½–2½ mm. which indicate that it may be possible to diminish yields of pitch from 25–35 to 16% or even less, without decomposing it appreciably.

[428]. 33.3 : 34.6 : 33.39 (79) : 34.24 (79). BENSON, H. K. **Products from pulp and pulpwood on Pacific coast.** *Paper Tr. J.* 126 (12), 1948 (59–62). 2 refs. P.R.

Discusses local developments in the manufacture of secondary products from waste liquor and bark. Ethyl alcohol is produced at the rate of 2,000,000 gallons a year from sulphite

waste liquor. Before the end of 1948, both ammonia- and calcium-base waste liquor will be processed for sale as concentrated liquid or as spray-dried solids. Development work is under way for using waste liquor for fuel, land dressings and yeast production. The fractionation of Douglas Fir bark into cork, ligneous fibres and powder (Silvacon products) has reached a commercial scale. Similar products are obtained in California from Redwood bark.

[429]. 33.3 : 34.6 (485). NIKANDER, B. Sulfitlutindunstningens nuvarande ståndpunkt i Sverige. **[The evaporation of sulphite waste liquor in Sweden: the present position.]** *Papp. Trävarutidskr. Finl.* 30 (7A), 1948 (53–6). 10 refs. [Sw.sw.e.] P.R.

[430]. 33.3 : 34.6. SCHWABE, K. Über die Verdampfungsgeschwindigkeit von Sulfitablauge. **[The rate of evaporation of sulphite waste liquor.]** *Holzforschung, Berlin* 2 (1), 1948 (24–8). [G.] P.R.

[431]. 33.3 : 34.6. HIESTER, N. K., MCCARTHY, J. L., and BENSON, H. K. **The separation of lignin sulphonic acids from sulphite waste liquor by batch dialysis.** *Paper Tr. J.* 126 (16), 1948 (58–61). 23 refs, P.R.

[432]. 33.3 : 34.6. DANIEL, H. S., and MCCARTHY, J. L. **The butyric-acid fermentation of sulphite waste liquor.** *Paper Tr. J.* 126 (5), 1948 (43–6). 13 refs. P.R.

33.32. Pulp and Paper Manufacture. Wallboards. Plastics

See also *For. Abstr.* 10 (Nos. 296, 308).

[433]. 33.32 (44). CERIGHELLI, R. Ressources de la France en plantes à papier. **[French resources of paper-producing plants.]** *Rev. int. Bot. appl. Agric. trop.* 26 (279/80), 1946 (10–21). 14 refs. [F.] P.R.

[434]. 33.32 : 12.29. BHARGAVA, M. P. **Bamboo for pulp and paper manufacture. Parts I–III.** *Indian For. Bull.* No. 129, 1946. pp. 25 + 4 photos, 5 tbls.

Part I gives an account of investigations from 1860 to 1944 and an outline of future investigations. Part II deals with the digestion of Bamboo, and Part III with its proximate chemical analyses. A series of appendixes give data on semi-commercial pulping tests, strength properties of kraft pulps, annual Indian production of papers, and proximate chemical analyses of the following species:—*Dendrocalamus strictus* (of 8 provenances and various stages of development), *D. hamiltonii*, *D. longispathus*, *Melocanna bambusoides*, *Bambusa arundinacea*, *B. polymorpha*, *B. tulda*, *Ochlandra travancorica*, *Oxytenanthera nigrociliata* and *Teinostachyum dullooa*. [Cf. *For. Abstr.* 10 (No. 455).]

[435]. 33.32 : 33.6. GILLESPIE, W. F. **New material for better boxes.** *Fibre Contain.* 32 (9), 1947 (59–60, 62). P.R.

Considers materials—hardwoods, bagasse, cane, other annual crops and Douglas Fir—pulping methods, treatment of boards, and adhesives used in making corrugated and solid fibre types of box.

33.32.1. *Pulp Manufacture*

See also *For. Abstr.* 10 (No. 270).

[436]. 33.32.1 : 07.2 : 07.7. NEDERVEEN, G. VAN. Standard-apparaten voor het onderzoek van celstof. **[Standard apparatus for pulp evaluation.]** *Pamflet, Vezelinstituut T.N.O., Delft* No. 4, 1947. pp. 6. [Du.e.] P.R.

[437]. 33.22.1 : 07.7. BUTLER, W. T. **The use of the Bauer-McNett fibre classifier.** *Pulp Paper Mag. Can.* 49 (3), 1948 (133–6). 2 refs.

[438]. 33.32.1. MONTMORENCY, W. H. DE. **The longitudinal grinding of wood.** *Pulp Paper Mag. Can.* 48 (3), 1947 (197–208). 8 refs.

Longitudinal and transverse grinding are defined. The results of numerous comparisons of the two methods made with the aid of a miniature grinder are given. All results are for grinding which is a combination of end of grain and tangential grinding due to the fact that there existed an appreciable angle of attack of stone surface to the fibres. The effects of varying the grinding pressure in longitudinal grinding and the influence of stone surface condition upon the relation of longitudinal to transverse grinding are discussed. For a given stone surface, peripheral speed and grinding pressure, it is shown that in longitudinal grinding under the conditions specified, production is lower, and power cost and pulp

strength are higher, than for transverse grinding. Freeness of pulp in longitudinal grinding is low. Work is to be continued on grinding which approaches tangential grinding more closely. *Author's abstract.*

[439]. 33.32.1. MONTMORENCY, W. H. DE. **The longitudinal grinding of wood—further work.** *Pulp Paper Mag. Can.* 49 (3), 1948 (115–23). 3 refs.

Transverse and longitudinal grinding were compared over a range of grinding pressures from 20 to 60 lb. per sq. in. inclusive, on a well conditioned pulp stone surface. In the longitudinal grinding the maximum possible obliquity of wood fibres to stone surface was limited to 1° 47′ by the use of a short grinding zone. It was found that, at all grinding pressures, the quality of the pulp produced by transverse grinding was slightly superior to that of the pulp made by longitudinal grinding. At all grinding pressures the amount of reject material in the pit pulp was very high in longitudinal grinding, reaching the figure of one third of the total wood ground at medium pressures. Rate of grinding of wood was higher in longitudinal grinding except at the lowest pressures but this was more than nullified by the high percentage of unacceptable material produced. Energy requirements, based on accepted pulp, were higher for longitudinal grinding, but tended to reach equality with those for transverse grinding at the higher grinding pressures. The use of an unconditioned stone surface was not as deleterious to pulp quality in longitudinal grinding as in transverse grinding. The employment of longitudinal grinding on a mill scale would require drastic redesign of present grinding equipment. There was some indication that longitudinal grinding under certain conditions may be of value in the production of coarse mechanical pulp for insulating-board manufacture. *Author's abstract.*

[440]. 33.32.1. VILARS, J. Étude de la pâte mécanique de râperie. [**Groundwood pulp.**] *Le Papier* 47 (1, 2), 1944 (17–18, 21–6, 29–30, 33–40, 65–6, 69–74, 77–81). [F.f.] P.O.

Discusses the effect on tensile strength, tearing strength, wet strength and freeness, of mixes containing varying proportions of pulps of different fibre length and thickness; the qualities of different species; the effect of the moisture content of the wood; and grinding conditions.

[441]. 33.32.1 : 12.11.15 : 12.21. PEHRSON, S. **A bacterium occurring in wet mechanical pulp producing a heat-stable, highly fungicidal substance.** *Svensk bot. Tidskr.* 41 (3), 1947 (354–64). 13 refs. [E.] O.B.D.

Investigations at the Swedish Forest Products Laboratory on the bluing and rotting of groundwood pulp and the antagonistic effect of certain microorganisms led to the isolation of a bacterium which plays an important part in retarding the growth of bluing fungi, and probably that of rotting fungi also. A report on preliminary researches is made.

[442]. 33.32.1 : 31.42.1. GADD, G. O. Om betingelserna för en utveckling av svampmycel i mekanisk trämassa. [**Conditions favourable to the development of fungus mycelium on groundwood pulp.**] *Papp. Trävarutidskr. Finl.* 30 (7A), 1948 (26–32). 8 refs. [Sw.e.] P.R.

Discusses the theory that bacteria present in the pulp hinder the growth of colonies of rot and stain fungi, and describes and tabulates the results of experiments to discover whether the controlling factor for the inhibition of fungus growth by bacteria is the release of antibiotic substances into the wood pulp, or the competition for food, since pulp is naturally of low nutritional value. Experiments showed that fungus growth was heavier (1) on sterilized than on unsterilized pulp and (2) on pulp with nitrogen and phosphorus added than on natural pulp. The conclusion drawn is that the controlling factor is the competition for food.

[443]. 33.32.1 : 07.7. MURTO, J. O. Selluloosapuun lastutus, I. [**The chipping of pulpwood, I.**] *Papp. Trävarutidskr. Finl.* 29 (18), 1947 (263–73). 32 refs. [Fi.e.] P.R.

Discusses the results of chipping experiments with pulpwood, undertaken by the Central Laboratory, Helsinki, in co-operation with some of the cellulose mills, and advances theories to account for the observed improvement in the opacity of paper from sulphite cellulose when the chips are crushed at one end. Includes a history of the development of chipping machinery and suggestions for improving efficiency through research work.

[444]. 33.32.1. MURTO, J. O. Rikin rooli sulfaattiselluloosan valmistustekniikassa. **[The part played by sulphur in the technique of sulphate pulp production.]** *Papp. Trävarutidskr. Finl.* 29 (23; 24), 1947 (346–52; 363–9). 38 refs. [Fi.e.] P.R.

Discusses the chemistry of sulphate pulping and the effect of varying the proportion of sulphur.

[445]. 33.32.1 : 12.25. HART, J. S., and STRAPP, R. K. **Alkaline pulping—Spruce.** *Pulp Paper Mag. Can.* 49 (3), 1948 (151–65).

A study was made of the following variables in the alkaline pulping of Black Spruce [*Picea mariana*]:—the influence of sulphidity and of various active alkali charges at different temperatures; of various cooking times at different maximum temperatures; and of various amounts of black liquor in the cooking liquor. It was found that black liquor taken from a mill system slowed up cooking, and that this balanced any benefit from increased alkali.

[446]. 33.32.1 (47) : 34.6. ELIASHBERG, M. G. **Technical problems of cellulose production.** [Tekhnicheskie problemy tsellyuloznogo proizvodstva.] Information Service, Coun. sci. industr. Res. Aust. 1947. pp. 5. Translated by D. Armstrong and A. J. Watson from *Bumazhnaya Promȳshlennost'* 21 (5/6), 1946 (9–13). P.R.

Summarizes the Russian article, giving particular attention to developments in the U.S.S.R. in the field of sulphite pulping processes, covering: the preparation and recovery of SO_2; concentrations of cooking acid; and prehydrolysis of the wood, which besides increasing yields, removes hemicelluloses that give 200 kg. yeast and 100 l. alcohol per ton of cellulose after treatment. Deals more briefly with washing processes, the evaporation and concentration of black liquors, treatment of sludges, cleaning of celluloses, bleaching and drying.

[447]. 33.32.1 : 01.6. POTTER, G. J. C. **A review of the literature of the sulphite process: September 1946–August 1947.** *Pulp Paper Mag. Can.* 49 (3), 1948 (316, 318, 320). 22 refs.

Covers phases of the sulphite process up to the discharge of pulp from the digester. It includes recovery of heat and SO_2 from the blow, but not the disposal or utilization of the waste liquor.

[448]. 33.32.1. LOUGHEED, E. H. **The use of liquid sulphur dioxide for calcium bisulphite acid production.** *Pulp Paper Mag. Can.* 49 (3), 1948 (215–21). 6 refs.

[449]. 33.32.1 (45). MARPILLERO, P. **Xilon —a new chemurgic process.** *Chemurg. Dig.* 6 (23), 1947 (347–8). D.S.I.R.

Discusses a new method of chemical pulping practised in Italy which dissolves the hemicellulose (subsequently recovered in the form of sugars) and leaves the cellulose fibres coated with lignin, which is softened by the same chemical process. It is claimed that the process is cheaper and less wasteful than any other pulping process.

[450]. 33.32.1 : 07.2 : 01.4. RUNKEL, R. O. Über die Herstellung von Holzzellstoff unter Verwendung von Natriumchlorit. **[The preparation of wood pulp using sodium chlorite.]** *Holzforschung, Berlin* 2 (1), 1948 (1–12). 56 refs. [G.g.] P.R.

Reviews earlier literature and describes a 3-stage method—(1) treatment with NaOH, (2) defibration, (3) treatment with $NaClO_2$—of preparing pulp. Describes and tabulates the qualities of pulp prepared in this way from different German and tropical species, and suggests that the method be adopted as a standard for evaluating the utility of new materials for pulping.

[451]. 33.32.1 : 01.4. FISHER, J. H., and MEAD, B. R. (to Ontario Paper Co., Ltd.) **Paper pulp.** *Canad. Patent* No. 444,664, Oct. 21, 1947. *Chem. Abstr.* 42 (7), 1948 (2430). P.R.

Ligno-cellulose materials, e.g. Sprucewood chips, are treated with a solution containing $Na_2Al_2O_4$ as an active pulping agent. The active chemicals in the residual liquor can be recovered. The pulp is brown, free-draining, of high initial tearing strength, and capable of developing substantial Mullen strength on beating.

[452]. 33.32.1 : 12.26–8. TRIVEDI, S. A., KINGSBURY, R. M., and SIMMONDS, F. A. **Extraction treatments in bleaching Aspen neutral sulphite semi-chemical pulp.** *Repr.* from *Paper Ind.* 29, 1948 (1443–53). 23 refs. P.R.

[453]. 33.32.1 : 31.42. NEAL, E. L., and JENNINGS, S. F. **Slime control at the Anglo-Canadian Pulp and Paper Mills Ltd., 1947.** *Pulp Paper Mag. Can.* 49 (3), 1948 (137–42).

33.32.2. *Paper Manufacture*

[454]. 33.32.2 : 31.1 : 31.27 : 12.25. KLAUDITZ, W., MARSCHALL, A., and GINZEL, W. Zur Technologie verholzter pflanzlicher Zellwände. Ermittlung der Zugfestigkeit von Zellstoffasern aus *Pinus merkusii*-Holz. [**The technology of lignified plant cell-walls. Determination of the tensile strength of cellulose fibres of *Pinus merkusii*.**] *Holzforschung, Berlin* 1 (4), 1947 (98–103). 10 refs. [G.g.] P.R.

Discusses and tabulates the results of tests to determine the breaking length of the cellulose fibres of *Pinus merkusii*, as a measure of the strength of paper. The results of 2 experiments showed breaking lengths of 43·6 and 54·8 km., confirming the theoretical values of 40–50 km. Also describes experiments to determine the wet strength of cellulose fibres of *P. merkusii*, which proved to be 20·4% of the dry strength, compared with 41·9% for fibres dried and re-wetted.

[455]. 33.32.2 : 12.29. BHARGAVA, M. P., and BATRA, P. C. **Report on the discolouration of bleached Bamboo and grass pulps during storage.** *Indian For. Bull.* No. 128, 1942 [1947]. pp. 9.

Cf. *For. Abstr.* 10 (No. 434).

33.32.3. *Wallboards, Fibreboards, etc.*

See also *For. Abstr.* 10 (No. 649).

[456]. 33.32.3. HERITAGE, C. C., and DUVALL, T. C. **Whole wood fibre manufacture.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 8. P.R.

Discusses briefly the various chemical and mechanical processes of fiberization, their commercial use and the quality of fibre produced, and describes in detail the Asplund process. Analyses the use requirements of fibre for thermal insulation and correlates them with the fibre properties. Describes a process of felting baled whole wood fibre within the space to be insulated in refrigerators.

[457]. 33.32.3 : 38.2. **Fibre building boards.** The Building Boards Joint Committee, Melbourne House, Aldwych, London, W.C.2. 1947. pp. 62 + 13 + 56 photos. P.R.

Contains chapters on: fibre building boards; insulating boards; thermal insulation; sound control; wallboards; hardboards; wall construction; floor and ceiling construction; roof construction; methods of fixing; joint treatment; and surface finishes.

[458]. 33.32.3 : 01.4 (431–5). SAECHTLING, H. Einige neue Verfahren zur Erzeugung von Bauplatten aus geringwertigen Holzrohstoffen. [**Some new methods of making fibreboards ['Tronal' products] from low-grade wood waste.**] *Holzforschung, Berlin* 2 (1), 1948 (21–4). [G.] P.R.

Cf. *For. Abstr.* 8 (No. 440).

[459]. 33.32.3 : 33.16. BILLMAN, H. Träullsplattor. [**Wood wool slabs.**] *Byggmästaren* 25 (3), 1946 (45–52). 14 refs. [Sw.] R.I.B.A.

Discusses the results, given in graphs and tables, of tests on wood-wool slabs from 12 Swedish manufacturers. The tests covered density, moisture absorption, shrinkage and swelling, strength, heat and sound insulation, and resistance to fire, frost and rot.

[460]. 33.32.3. [HUBERT, E. E.] **A new type wallboard.** *W. Cst. Lumberm.* 75 (1), 1948 (105).

A new type of wallboard developed by Monsanto Chemical Co., for which shavings, sawdust or any form of ground or shredded wood may be used, and which requires only 2 to 4% of binder. Sheets are placed in a cold press for 5 to 7 seconds, then in a hot press at 300° F. for not more than 8 seconds at about 200 lb. pressure.

[461]. 33.32.3 : 34.24. CLERMONT, L. P., and SCHWARTZ, H. **Studies on composition of bark; utilization for structural boards.** *Paper Tr. J.* 126 (19), 1948 (57–60). 12 refs. [Forest Products Laboratories, Ottawa.] P.R.

Tabulates the results of analyses of bark from Balsam (*Abies balsamea*), Black Spruce (*Picea mariana*), White Spruce (*Picea glauca*), Eastern White Hemlock (*Tsuga canadensis*), and Douglas Fir (*Pseudotsuga taxifolia*), and describes and tabulates the results of experiments on preparing insulating boards and hardboards from barks of Western Red Cedar (*Thuja plicata*) and Eastern White Cedar

(*Thuja occidentalis*). Concludes that a satisfactory insulating board can be made from the latter. Western Cedar bark alone produces a board of very low tensile strength. Hardboards from Eastern Cedar bark are considerably higher in modulus of rupture and tensile strength than boards from Western Cedar bark.

[462]. 33.32.3 : 12.25 : 34.24. **Structural boards from Western Red Cedar bark.** *B.C. Lumberm.* 32 (2), 1948 (91).

Boards made from Cedar [*Thuja plicata*] bark alone are too low in tensile strength, but the addition of 10% of sulphite pulp or 10% of sulphite screenings produces boards of acceptable strength. The Cedar bark was chipped and the chips steamed and then disintegrated in a beater.

[463]. 33.32.3 : 34.6 : 33.32.1. Le panneau Rauma: un nouveau produit isolateur finlandais. **[The Rauma panel: a new Finnish insulating material.]** *Rev. int. Bois* 15 (127), 1948 (13). [F.]

Account of the method of manufacture of insulating board from bisulphite waste liquor and knot pulp, which are whipped to a foam before being drained and formed into boards. No pressure is applied during manufacture and the product is very porous and light, its weight not exceeding 65–70 kg./cu.m., and its coefficient of insulation being 0·035 (about the same as that of cork).

[464]. 33.32.3 : 33.36. ROWLEY, F. B., LAJOY, M. H., and ERICKSON, E. T. **Vapor resistant coatings for structural insulating board.** *Bulletin, Minnesota University Engineering Experiment Station* No. 25, 1946. pp. [ii] + 31. P.R.

An account of investigations on the vapour permeability of various paint and asphalt coatings when applied to insulating-board sheathings.

33.34. Dyeing and Bleaching of Wood

[465]. 33.34 : 33.12 : 33.13. **Wood and shingle stains.** *Lett.-Circ. U.S. Bur. Stand.* No. *LC*867, 1947. pp. 9. 17 refs. P.R.

Discusses briefly the main types of stains for the finishing of wooden furniture, instrument cases, fruit baskets and similar surfaces, and those suitable for use on comparatively rough exterior woodwork such as shingles, weatherboards and fences.

[466]. 33.34 : 33.12 : 33.8. SWARD, G. G. **Recent developments in wood finishing.** *Prepr. U.S. For Prod. Res. Soc.* 1947. pp. 5. P.R.

33.36. Wood Finishes. Preservation of Wood. Seasoning and Drying

See also *For. Abstr.* 10 (Nos. 372, 464–6).

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 10 (Nos. 275, 298, 571).

[467]. 33.36.1 : 33.31 : 07.2 : 01.4. RICHARDS, C. A., and ADDOMS, R. M. **Laboratory methods for evaluating wood preservatives: preliminary comparison of agar and soil culture techniques using impregnated wood blocks—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (41–58). 7 refs.

[468]. 33.36.1 : 33.31 : 07.2 : 01.4 : 31.43. WAKEMAN, C. M. **Discussion of recent laboratory biological survey methods for comparing various toxicants used to combat marine borers.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (220–1).

Describes a short-term laboratory test for comparing the toxicity of various wood preservatives repellent to marine borers.

[469]. 33.36.1 : 33.31 : 33.36.2. JAMYN, S. Les agents chimiques pour la protection du bois. **[Chemical agents for wood preservation.]** *Rev. Chim. industr.* 50 (584), 1941 (49–82). 114 refs. [Fr.] P.O.

A comprehensive list of the different chemical preservatives, their nature, properties and uses, divided into the 3 main groups, organic, mineral and mineral-organic, and sub-divided according to their chemical composition.

[470]. 33.36.1 : 33.31 : 33.53. **Report of Committee 4.—Preservatives.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (39–55).

On the evidence of data provided by the subcommittee on changes in creosote in use, Standard Specification for creosote, 4*f*, was amended to allow an increase of 1½% of coke

residue in samples taken from working tanks, since an increase in insoluble of 1% is already permitted by the specification.

[471]. 33.36.1 : 33.31. **Report of committee 4—preservatives—with appendices and discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (58–93). 9 refs.

Revisions of the manual include an added footnote to Standard 49*c* allowing the use of petroleum of lower specific gravity than 0·96 at 60° F. for blending with creosote, provided that the oil has proved satisfactory. Some additional information on the use of pentachlorophenol [cf. *For. Abstr.* 7 (No. 862)] and copper naphthenate as wood preservatives is included, with some service records. Appendices describe a plant control method for the determination of pentachlorophenol in oil solutions, a tentative technique for determining the relative sludging characteristics of petroleum–oil solutions of pentachlorophenol, a proposed federal specification for a pentachlorophenol wood preservative, and requirements and methods of analysis for copper naphthenate solutions.

[472]. 33.36.1 : 33.31 : 07.2 : 01.4. BESCHER, R. H., and KEPFER, R. J. **Accelerated service tests of wood preservatives—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (57–70). 6 refs.

Data from test plots maintained since 1932 by E. I. du Pont de Nemours & Co., Inc. and Koppers Co., Inc., to evaluate wood preservatives are presented. Groups of specimens, set to about half their length in fertile ground, reached their average life when 60% of the group had suffered severe decay. On this basis the average service life could be calculated before the final decay of all specimens. Results of tests are tabulated to compare different types of preservative and different species of wood treated with the same preservatives. White Oak shows superior durability in these accelerated tests. They indicate that Black Gum is more difficult to preserve than Southern Yellow Pine or Douglas Fir. Copper-bearing preservatives, as a group, are superior to the standard salt preservatives. In contradiction to the results of laboratory tests [cf. *For. Abstr.* 8 (No. 498)] fire-retardant mixtures are not good preservatives.

[473]. 33.36.1 : 33.31. VAUGHAN, J. A. **Characteristics and related toxicity of hydrocarbon oils.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 6. 9 refs. P.R.

Research, in an attempt to determine causes underlying the toxicity of certain hydrocarbon oils, has led to the development of controls which may be employed in producing toxic hydrocarbon oils from any source of hydrocarbon material. It has further determined that the presence of aromatic hydrocarbons and an established relation between the specific-gravity/boiling-point ratio of hydrocarbon oils may be employed as a means of predicting their toxicity towards fungi. *From author's summary.*

[474]. 33.36.1 : 33.31. BAECHLER, R. H. **Relations between the chemical constitution and toxicity of aliphatic compounds.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (94–110). 23 refs.

A study to explore the possibilities of aliphatic compounds as wood preservatives. Aliphatic compounds show considerable regularity in the relationship between their chemical structure and their toxicity to a test wood-destroying fungus. In homologous series, toxicity increases with molecular weight until solubility becomes insufficient to give a lethal concentration. Toxicity is increased by a double bond or by the introduction of halogens, or alkyl, nitro, amino, aldehyde or phenyl groups; it is decreased by hydroxyl, amide, keto, or cyanide groups. Some logarithmic relationship appears to exist between the simultaneous effects of a group on molecular weight and toxicity. A fairly accurate prediction of the toxicity of a compound from its molecular structure is possible in many cases, but such predictions are dangerous, not only because of possible error in the accepted value for the parent compound, but also because of effects of molecular configuration on the nature of certain groups. *From author's summary.*

[475]. 33.36.1 : 33.31 : 31.42. **Timber preservation.** *Timb. Tr. J.* 185 (3742), 1948 (1089).

A new wood preservative from the laboratories of Ward, Blenkinsop & Co., Ltd., consists of Fixtan acid combined with phenyl mercury. The powder resulting from the combination is readily soluble in water (1 lb. to 100 gal.) and is toxic to all forms of wood-destroying fungus. A deep penetration is obtained by brushing, dipping and spraying,

the preservative is not leached out by water, is not dangerous to handle and leaves the timber uncoloured and able to take polish or paint easily.

[476]. 33.36.1 : 31.42.11 : 12.21. BOKOR, R. Adatok a házigomba (*Merulius domesticus* syn. *lacrimans*) fertózésének kérdéséhez és az ellene való védekezés egyes módszereinek kiegészítéséhez. **[Contributions to the problem of infection by dry-rot (*Merulius lacrymans*) and the perfection of methods of combating it.]** *Erdész. Kisérl.* 46, 1945–6 (156–66). [Hu.g.]

The ability of *Merulius lacrymans* to attack sound wood was confirmed. Impregnation with a 2% solution of sodium fluoride (90 parts by weight) and sodium dinitrophenolate (5 parts by weight), or painting with a 4½% solution of the same mixture is recommended.

[477]. 33.36.1 : 33.31 : 31.22.3 : 31.43. BECKER, G., GASDA, G., and THEDEN, G. Versuche über den Vorgang der Schutzsalz-Eindringung in Holz und seine Abhängigkeit von der Luftfeuchtigkeit. **[Experiments on the penetration of protective salts into wood, and its relationship to the moisture content of the air.]** *Holzforschung, Berlin* 1 (4), 1947 (103–12). 22 refs. [G.g.] P.R.

Describes and tabulates the results of experiments to ascertain the effect of the moisture content of the air on the rate and depth of penetration into Pine sapwood of 6 salts (NaF, $MgSiF_6$, $ZnSiF_6$, KF.HF and 2 commercial preparations), chosen for their effectiveness against insect attack and applied by painting, in 2 coats. Over a period of 16 weeks all the salts, in varying degrees, penetrated more deeply into the wood and at a higher rate, with increased moisture content of the air. The author discusses the importance of this fact in protection of wood against insect attack and its implications for choice of moisture-content conditions at the time of applying protective salts.

[478]. 33.36.1 : 33.31. HÄGER, B. O. (to Bolidens Gruvaktiebolag). **Wood impregnating solutions.** *U.S. Patent* No. 2,432,007, Dec. 2, 1947. *Chem. Abstr.* 42 (4), 1948 (1375). P.R.

The impregnating solutions are double salts of Zn, Cu, Cd, or Al with H_3AsO_4 and CrO_3. The latter should be present in amounts sufficient for the Cr ions to bind the excess of H_3AsO_4 with the formation of arsenate not easily soluble. When Zn, Cu, or Cd is used, the metal compound may be present in an amount up to 0·6 per 1 molecule of H_3AsO_4; in the case of Al the most suitable proportions are about 1 molecule of Al_2O_3 or 2 molecules of $Al(OH)_3$ to 4 molecules of H_3AsO_4.

[479]. 33.36.1 : 33.31 : 31.42.11. KINBERG, W. Jamförande undersökningar mellan Boliden-saltets och andra träskyddsmedels skyddsverkan mot röta. **[The protection against rot afforded by Boliden salts, compared with that of other wood preservatives.]** Kungl. Vattenfallstyrelsen, Stockholm. 1946. pp. 31. 15 refs. [Sw.sw.g.e.] Price: Kr. 4.50.

[480]. 33.36.1 (410 : 931 : 94 : 68) : 33.91. HICKSON, H. E., JOFEH, A. J., and BULMAN, R. A. **Notes on wood preservation, by pressure methods, in Great Britain, New Zealand, Australia and South Africa, against a background of standardization.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (265–77).

[481]. 33.36.1 : 33.31. GORDON, A. **Chemonite, its history and development.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (278–85).

[482]. 33.36.1 : 33.31. FRITZ, E. **Development of Chemonite and its service record.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (285–92).

[483]. 33.36.1 : 33.31 : 07.7. OTT, C. W. **Chemonite as a commercial treatment—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (292–302).

[484]. 33.36.1 : 33.36.3 : 07.7. BUSHLEY, H. R. **Modern equipment for the Boulton process—[a discussion of problems and recommendations for design of equipment.]** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (174–82).

[485]. 33.36.1 : 01.4. SIEMENS-SCHUKERTWERKE A.G., BERLIN-SIEMENSTADT. Verfahren zum Tränken von Gegenständen aus Holz und anderen tränkbaren Stoffen. **[Method of impregnating articles of wood and other absorbent materials.]** *Ger. Patent* No. 724684, Sept. 3, 1942. *Prev. Deterior. Abstr.* 3 (5), 1947 (W.56). D.S.I.R.

A modification of the process of impregnating wood by inserting the impregnating material such as tar into a completely enclosed cavity within the wood is suggested. The cavity containing the impregnating material may be closed with a stopper, preferably of material of low dielectric value. The wood is subjected to an ultra-high-frequency field such as may be set up by condenser plate electrodes which are separated by a distance of 30 cm. and operate at a potential of 20,000–30,000 v. and a frequency of 3,000,000 c.p.s. (wave length 10 m.) (*sic*). Since the dielectric loss of liquids in the electric field is as a rule particularly high, the impregnating material will be vapourized and the pressure will force the material through the pores of the wood. The addition of a material such as graphite to the impregnant increases the absorption of energy and the efficiency of the operation. The process is completed when the impregnant appears on the outer surface of the wood.

[486]. 33.36.1 : 01.4 : 07.7. HÄGER, B. O., and KJELLSTRÖM, S. B. (to Bolidens Gruvaktiebolag). **Full-cell process and apparatus of impregnating wood.** *U.S. Patent* No. 2,432,008, Dec. 2, 1947. *Chem. Abstr.* 42 (4), 1948. (1375). P.R.

A charge of timber is disposed in a treating zone and subjected to a vacuum. A preservative, in the form of an aqueous solution or emulsion, is introduced from a supply zone until the timber is submerged in it. The supply is then cut off, the vacuum discontinued and super-atmospheric pressure applied to make the cell absorb the preservative. After absorption is complete, a vacuum may again be applied to the timber to remove excess preservative. The apparatus used is described.

[487]. 33.36.1 : 33.31 : 31.43 : 13.2. HARNDEN, R. C. **New insecticide controls ambrosia (pinhole) beetles.** *Sth. Lumberm.* 176 (2211), 1948 (56).

The Chapman Chemical Co., of Memphis, Tenn., is now manufacturing an emulsifiable concentrate of benzene hexachloride, called Ambrocide, which contains 8·25% of the γ isomer of benzene hexachloride. When diluted with 19 parts of a petroleum distillate and sprayed on logs so as thoroughly to wet the whole surface, Ambrocide is said to give complete protection against ambrosia beetles. It may also be applied as a dip at the same time as stain-control chemicals.

[488]. 33.36.1 : 31.43 : 12.29 : 13.2 : 33.31. PLANK, H. K. **DDT for powder-post beetle control in Bamboo.** *Science* 106 (2753), 1947 (317). 1 ref. D.S.I.R.

Tests showed that external application of DDT to culms of *Bambusa vulgaris* resulted in 94% control of infestation by the Bamboo powder-post beetle (*Dinoderus minutus* F.) as against 3–6% control produced by solutions of pentachlorophenol in kerosene and in water plus sulphur. The DDT solution did not discolour the wood or affect its quality.

[489]. 33.36.1 : 31.43 : 13.2 : 33.31. **DDT spray treatment for prevention of *Lyctus* attack.** *Leafl. For. Prod. Res., Lond.* No. 43, 1948. pp. 1. P.R.

[490]. 33.36.1 : 33.31 : 41. SCHMITZ, W. R., and GOETTE, M. B. **Penetration of DDT into wood surfaces.** *Soap* 24 (1), 1948 (118–21). 6 refs. P.R.

Discusses and tabulates the results of tests to show the effect of solvent, species of wood and surface condition on DDT penetration. The bulk of the tests were carried out on Poplar wood but in the species test 7 different species were used. The conclusions drawn are: that a 5% DDT emulsion penetrates more deeply than a 5% DDT-paraffin solution; that there is little correlation between the physical properties of the wood and the recovery of DDT; and that wood which has been sprayed with water 15 minutes before spraying with DDT gives better recovery than dry wood.

[491]. 33.36.1 : 33.31 : 13.2. **DDT as anti-termite treatment for timber, fabric and cordage.** *Report, Technical Development Establishment, Stores (Laboratories), Cawnpore, U.P., India* No. BIO/47/62, 1947. p. 1 + 1 tbl. 1 ref. P.R.

Concludes from the tabulated results of graveyard tests that a concentration of DDT equal to 0·25% of the weight of the test material gives satisfactory protection.

[492]. 33.36.1 : 31.43 : 13.2 : 13.15. NOIROT, C., and ALLIOT, H. La lutte contre les termites. **[Termite control.]** Masson & Cie., 120 Blvd. St.-Germain, Paris. 1947. pp. 96. 33 refs. [F.]

A comprehensive study in 3 parts: (1) biology of termites (pp. 9–32) [cf. *For. Abstr.* 10 (No. 129)]; (2) methods of destruction (pp. 33–47); (3) protection of timber, buildings [cf. *For. Abstr.* 10 (No. 645)], works of art etc. (including a list of the most resistant species of wood) [cf. *For. Abstr.* 10 (No. 301)]. Specifications are given in appendixes (*a*) for creosote for impregnation, (*b*) for creosote for injection into poles.

[493]. 33.36.1 : 31.43 : 13.2. ALLIOT, H. Protection du bois d'oeuvre contre les termites. **[Protection of converted wood against termites.]** *Broch. tech. Lab. d'Essai des Bois, Paris* No. 5, 1946 (9–12). [F.] P.R.

[494]. 33.36.1 : 31.43 : 13.2. FISHER, R. C. **Some aspects of termites and their control.** Industrial Pest Control Association. 1948. pp. 15. [Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks.] P.R.

Discusses the development of a termite colony, their food, habitat groups (subterranean and mound-building ground dwellers and wood termites inhabiting damp or dry woods), their damage, and its prevention by proper construction of buildings, by soil poisons, and by using naturally resistant or treated timber; summarizes the present state of research into termite control.

[495]. 33.36.1 : 33.15 : 33.31 : 33.36.2 : 33.4. **Report of special committee on preservative and fire-retardant treatments of laminated members (plywood and glued-up fabrication).** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (333–63).

Pressure-treatment of glued wood is successful so long as waterproof resin glues are used. The pH of the liquid glue must not be appreciably altered if a satisfactory set is to be obtained. Results are given of standard dry-shear-block tests on Douglas Fir and Southern Yellow Pine treated with (1) a water-soluble preservative, (2) a fire retardant, (3) coal-tar creosote. Four types of glue were used. Results, though not conclusive, indicate that low-temperature resorcinols are successful with all three types of treated wood. Casein glues are successful with (1) but not (2); cold-press ureas with both (1) and (2); low-temperature phenols with (1) and (3) but not (2). The last mentioned have high water resistance and durability and are therefore recommended for glued laminated structural members.

A description is given of methods of making a type of laminated arch. The timber was pressure-treated—some laminae with a toxic-salt preservative and others with a fire-retardant before gluing. The wood was then kiln dried to approximately 15% moisture content before gluing, and arch laminae were made by joining boards end to end by means of glued scarf joints. (Toxic-salt-treated timber was found to saw like untreated wood, but hard-alloy saws are recommended for the fireproofed wood.) The laminae were glued under pressure.

Several arch sections of untreated wood were also successfully treated with preservative or fire-retardant after gluing. Instructions are given for the fire-retardant and preservative treatment of plywood and of laminated members. Some data on gluing creosoted Southern Pine with a room-temperature-setting resorcinol resin and tables showing the effects of 3 standard fireproofing treatments on shear strengths of plywood glued with 3 types of adhesive are included. Well glued plywood bonded with phenolic, resorcinol, or resorcinol-phenol resin adhesives sustains no apparent injury under these three treatments; but these markedly reduce the strength and water resistance of plywood bonded with a room-temperature-setting urea-resin adhesive. Although the strengths of treated casein-glue plywoods were somewhat lower than those of untreated, such plywood, bonded with a highly water-resistant casein glue, could be used for interiors and moderately exposed localities. Uses of laminated members treated with preservatives and fire-retardant salts are described. [Cf. *For. Abstr.* 8 (No. 465).]

[496]. 33.36.1 : 33.15 : 33.31 : 33.36.2 : 31.27 : 12.26–8. BLEW, J. O. **The effects of treatments with wood preservatives and fire-retarding chemicals on the glue joints in Birch plywood.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (364–85). 4 refs.

Joint strengths of three-ply Yellow Birch made with different glues and then subjected to preservative and fire-retardant treatments are plotted and tabulated. The specimens were tested both before and after various kinds of exposure. Joint strengths were not seriously reduced by the treatments except in the case

of plywood glued with cold-setting urea resin and impregnated with water or water-borne chemicals. When plywood was soaked for various lengths of time in the original treating solution, strengths of joints made with casein glue or casein treated with a preservative were weakened by ammonium sulphate-phosphate. Untreated plywood glued with casein, casein plus sodium tetrachlorophenate, or a cold-setting urea-resin adhesive, deteriorates under prolonged exposure to high relative humidities and this deterioration intensifies when casein-glued plywood is treated with the fire-retardant chemicals used in this test and when plywood glued with cold-setting urea resin is treated with fire-retardants containing ammonium salts and possibly some of the wood preservatives. Fortified urea resin may not be satisfactory under high relative humidities when the plywood is treated with fire-retardants containing ammonium salts. Alternate exposure to high and low relative humidities seems to be less serious than constant exposure to high relative humidities when these chemicals and glues are involved. No effect on the strength of glue joints was observed when the plywood was exposed continuously to a relative humidity of 30%.

[497]. 33.36.1 : 33.15 : 33.36.2 : 33.4. **Report of special committee on preservative and fire retardant treatments of laminated members (plywood and glued-up fabrication).** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (231–50).

Experiments and findings of some commercial companies in the manufacture of glued laminated stringers (treated both before and after gluing) are reported, a series of proposed tests on the strength of laminated beams incised for pressure treatment are outlined and reports on some treated laminated constructions in use are given. [Cf. *For. Abstr.* 10 (No. 495).]

[498]. 33.36.1 : 33.31 : 33.15.5. KAUFERT, F. H., and HUTCHINS, W. F. **Experiments on the gluing of wood treated with oil solutions of chlorophenols.** *Sth. Lumberm.* 176 (2211), 1948 (84, 86).

Veneer, plywood, and lumber surfaces treated with mineral spirits or Stoddard solvent solutions of chlorophenols by a 30-second dip treatment were satisfactorily glued with casein, cold-setting urea-resin, and resorcinol-resin glues, provided that the treating solutions did not contain waxes or other water-repellent and sealer ingredients that are known to interfere with adhesion. The addition of Pine oil to mineral spirits or Stoddard solvent solutions of chlorophenols did not affect the gluing characteristics of surfaces treated with such solutions. There appeared to be only slight interference with adhesion of glues when the treating solution contained as much as 5% of rosin ester gum, but it is advisable that the amount of such 'anti-blooming' agents should be kept to a minimum. Surfaces treated with mineral spirits and Stoddard solvent solutions of chlorophenols appeared to be as readily glued immediately after treatment as when the solvent had been allowed to evaporate for 24 hours before gluing. Adhesion was improved by light sanding of the surfaces of plywood before gluing.

[499]. 33.36.1 : 33.4. **Report of committee 5–8. Wood blocks, pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (185–9).

A tentative standard specification was advanced for the preservative treatment of wood blocks for floors and platforms by pressure processes.

[500]. 33.36.1 : 33.52 : 33.4 : 12.26–8. **Report of committee 5–3.—[Black and Red] Gum ties and lumber pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (79–86).

[501]. 33.36.1 : 12.25 : 12.25 : 33.4 : 33.52 : 33.53. **Report of committee 5–6. Intermountain Douglas Fir and Western Hemlock, pressure treatment—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (141–9).

Recommendations covering standard specifications for the preservative treatment of piles, poles, railway ties and timber. A clause to be included in Standard 2*c* requires that Intermountain Douglas Fir and Western Hemlock piles and poles should have sapwood not less than $\frac{3}{4}$ in. thick at any point. [Cf. *For. Abstr.* 8 (No. 458).]

[502]. 33.36.1 : 12.25 : 12.25. **Report of committee 5–6. Intermountain Fir and Western Hemlock—pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (142–69).

Alterations and deletions in the manual were recommended and a new tentative standard 48*c*

(replacing 48*b*) concerning instructions for protecting cuts and holes made in pressure-treated wood is set out. The findings of a survey to obtain detailed information on current practices in treating Intermountain Douglas Fir and Western Hemlock, both in the U.S.A. and Canada, are tabulated in an appendix, and notes given on depths of penetration obtained.

[503]. 33.36.1 : 12.25 : 31.1. PROCTOR, P. B., and WAGG, J. W. B. **The identification of refractory Douglas Fir by means of growth characteristics—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (170–6).

Some preliminary investigations were made of anatomical features of Douglas Fir wood, which might help in identifying the coast-type and the so-called Intermountain and Rocky Mountain types and also in elucidating the greater refractoriness of the Mountain type to pressure treatment. A study of resin ducts showed that their frequency is closely related to growth rate. The average growth rate of coast-type Douglas Fir is considerably greater than that of the Rocky Mountain form. There also appears to exist a middle region in which growth falls between the two extremes. Coast-type wood (excluding that from second growth) has many more longitudinal resin ducts per ring than the Rocky Mountain form. The existence of a 'maturity cycle' or a peak of resin-duct production in the three seems likely. The occurrence of peaks in resin-duct production accompanying fluctuations of growth suggests that the longitudinal resin ducts of Douglas Fir are of traumatic origin. The ducts of coast-type Douglas Fir are at least twice the diameter of those of the Rocky Mountain form and the latter contain an abundance of tylosoids which are relatively rare in the coastal form. The number of radial ducts per unit area is constant for trees of all 3 growth regions. The occurrence of longitudinal ducts in second-growth coast-type trees during the first years of growth may be very variable. The growth is not as rapid as in old-growth trees and the longitudinal resin ducts are less numerous. If it is correct to assume that a relationship exists between the number of resin ducts and treatability, these data should help in establishing criteria for determining the treatability of Douglas Fir from its anatomical aspects. It is not entirely certain, however, that regional separations will suffice to identify refractory wood.

[504]. 33.36.1 : 33.5 : 33.4. **Report of committee 5–7. Miscellaneous species, both hardwoods and softwoods, ties and lumber, poles, and piles, pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (176–84).

[505]. 33.36.1 : 33.52 : 33.53 : 12.26–8. **Report of committee 5–1—Oak ties, lumber and piles, pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (72–7).

Tentative Standard Specification 52*b* for the treatment of Oak ties and lumber by pressure processes was amended to allow an increase in the temperature limits for zinc chloride to a maximum of 200° F. and was advanced to an adopted Standard. A tentative and incomplete specification for the preservative treatment of Oak piles by pressure processes was put forward. [Cf. *For. Abstr.* 8 (No. 477).]

[506]. 33.36.1 : 33.53 : 33.31. **Report of committee 7–4–1. Marine pile service records.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (207–20).

In addition to service data a proposed form for uniform reporting and recording of such data is presented. The results are given of exposure tests, made off the coast of Texas and North Carolina, on panels treated with Panalene SN (a highly aromatic distillate derived from petroleum sources) and Panalene SN tar solutions. Panels treated with Panalene SN alone resisted teredo attack during 2 years' exposure but suffered considerably from *Limnoria* attack. Panels treated with a solution containing coal tar in Panalene SN and a solution containing coal tar, creosote and Panalene SN gave complete protection against all types of borers over a period of 18 months at Port Aransas, Texas and complete protection for 3 years at Kure beach, North Carolina. The data indicate that the Panalene SN has desirable toxic qualities of its own, which, combined with coal tar, give protection equivalent or superior to that of creosote.

[507]. 33.36.1 : 31.43 : 13.2 : 33.31. **Progress report on tests at Port Aransas, Tex., on solutions containing coal tar and heavy oils with various carriers.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (193–202).

Tabulated data on test panels, pressure-treated with various preservatives and exposed to marine borer attack. They show the value of solutions containing high percentages of high-residue materials derived from coal tar in combating *Limnoria* attack.

[508]. 33.36.1 : 33.53. **Report of committee 7–12. Pressure treated foundation piles.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (271–5); 43, 1947 (339).

A report on the uses of creosoted wood piles as permanent foundations for buildings, bridges and other structures, with a suggested standard practice for their creosoting. This standard (Tentative Standard 67*a*) is adopted in the 1947 report.

[509]. 33.36.1 : 33.53 : 33.31. **Report of committee 5–5–1. Poles, pressure treatment—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (117–22).

An amended version of Standard 57*b* was adopted. Adopted Standard 37*d* was revised to include chromated zinc chloride, Tanalith, zinc meta-arsenite and creosote/petroleum solutions, and the revised standard rated as a tentative standard.

[510]. 33.36.1 : 33.53 : 33.31. **Preservative treatment of shade tent poles.** *Rep. Conn. agric. Exp. Sta. 1946*, [1947] (37).

A study was made of the possibility of treating non-durable woods to render them suitable for use as shade-tent poles in tobacco plantations. Treatment with a zinc-chloride solution has given good results and seems to be the most practical, cheap method. Chromated copper sulphate is also efficacious. Creosote was tried but proved unsatisfactory: where only the butts were treated, the tops decayed, and when the entire poles were treated, fumes from the creosote injured the tobacco plants.

[511]. 33.36.1 : 33.31 : 33.53 : 31.21.4. ANGELL, H. W. **'Wolmanized' wood for electrical transmission lines.** *Treating Record* 3 (12), 1947 (9–12). 4 refs. P.R.

Discusses the use of wood pylons to carry power cables and describes experiments to ascertain the effect of pressure treatment with Wolman salts on the electrical resistance of the wood at different moisture contents. The results are expressed in graphs.

[512]. 33.36.1 : 33.53 : 12.25. **Report of committee 5–5–2. Poles, non-pressure treatment.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (275–9).

Results of inspections of Southern Pine poles treated by the Osmoplastic method are presented. Osmosar—a mixture of sodium fluoride, dinitrophenol, sodium arsenate, potassium bichromate and a colloid—was diluted with water to give a retention of $\frac{1}{4}$ lb. of chemicals per cu. ft. of wood and was applied by brush. After treatment the poles were stacked horizontally and covered with waterproof paper for 60–90 days. Before being set they were end-coated with an asphalt compound. Poles set in 1936 by the Alabama Power Company showed a loss of 9·3% in 1944. Ten randomly selected poles from a number set in 1937 by the New York State Electric and Gas Corporation were 100% sound in 1944. [Cf. *For. Abstr.* 8 (No. 481).]

[513]. 33.36.1 : 33.53 : 33.31. **Report of committee 5–5–2. Poles, non-pressure treatment—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (122–5, 139–41).

Notes on some non-pressure treatments of poles and data from an inspection of poles set untreated and given Osmoplastic ground-line treatment in 1938 [cf. *For. Abstr.* 8 (No. 481)]. During the discussion some information was given on the sand-collar method of ground-line treatment, a process developed and used largely in Ontario. A galvanized iron collar is fastened around the pole at the ground line, the lower edge being fastened tightly to the pole and an opening of $1\frac{1}{4}$ in. being left at the top. The space is filled with sand holding a certain volume of creosote and borax. [Cf. *For. Abstr.* 1 (180).]

[514]. 33.36.1 : 33.53 : 33.31 : 12.25. COLLEY, R. H. **Non-pressure hot and cold bath treatments of Lodgepole Pine poles with creosote, and with pentachlorphenol petroleum creosote solution—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (282–96).

A progress report on non-pressure submersion treatments of seasoned Lodgepole Pine poles by two methods:—(1) hot creosote followed by cold creosote, (2) hot creosote followed by cold pentachlorphenol petroleum creosote solution. Tables show the depths of penetration achieved. A deeper penetration

and a higher % of sapwood penetration were obtained by method (2) in little more than half the total time required for method (1). Methods of determining the retention of preservatives are described. Preliminary results indicate that method (2) will give excellent results on cross arms of Jack Pine, Red Pine and coast and inland Douglas Fir, and on poles of the thinner sapwood species such as Western Cedar, Douglas Fir, and Western Larch.

[515]. 33.36.1 : 33.53 : 33.31 (79). HUBERT, E. E. **Non-pressure preservative treatment of poles with pentachlorophenol in the Northwestern states.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (126–39). 4 refs.

A review of pole treating in the Northwest States of the U.S.A. during 1946–47. Several secondary wood species and some new preservative treatments have been brought into use. Pentachlorophenol solutions, with or without creosote, have given good results in many plants. Requirements of solvent oils for pentachlorophenol are discussed and improvements in incising methods and power peelers are described. Data on some non-pressure treatments approved by the Rural Electrification Administration for poles of various species are included.

[516]. 33.36.1 : 33.53 : 07.7. GRAEBER, H. W. **Treating transmission poles in line service by spraying with a 5% pentachlorphenol petroleum solution.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (279–81).

Describes a drum for spraying standing, butt-treated poles that show signs of sapwood decay. Poles sprayed with a 5% pentachlorphenol petroleum solution in 1943 showed no decay progress up to 1945.

[517]. 33.36.1 : 33.54 : 33.31. BLEW, J. O. **Comparison of preservatives in Mississippi fence-post study after 10 years of service.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (26–41).

A report on the condition of treated fence posts subjected to service tests [cf. *For. Abstr.* 3 (326); 6 (36); 8 (No. 485)]. Posts treated with straight coal-tar creosote, a mixture of 50% coal-tar creosote and 50% crankcase oil, pentachlorophenol (4·82% in crankcase oil), tetrachlorophenol in crankcase oil, water-gas tar and zinc meta-arsenate, show no failures after 10 years' service. Those treated with copper sulphate/sodium arsenate show no failures after 5½ years' service.

Decay and termite attack were equally responsible for failures of untreated control posts and of posts treated with No–D–K (hardwood tar creosote). Termite attack was more important in the failure of posts treated with beta-naphthol, borax/boric acid, mercuric chloride, P.D.A. (phenyldichlorarsine), sodium bichromate, sodium chromate, and Osmoplastic. Posts treated with Celcure, chromated zinc chloride, coal tar, a mixture of 10% coal-tar creosote, Osmosar, pentachlorophenol (3·02% in crankcase oil), Wolman salt (Tanalith) and zinc chloride, showed some termite attack, but their failures were due mostly to decay.

Some of the water-borne preservatives used in this test are not recommended where wood is to be used in contact with the ground, but this does not mean that they are not adequate under more favourable conditions.

[518]. 33.36.1 : 33.54 : 76. HOPKINS, W. C. **Fence posts: production and treating costs.** *Bull. Miss. agric. Exp. Sta.* No. 439, 1946. pp. 27. 17 refs.

Describes processes of peeling and seasoning preparatory to treatment, and various preservative treatments (creosote by hot-and-cold-bath and dip methods, pentachlorophenol by hot-and-cold-bath and cold soaking, chromated zinc chloride, and Osmose process) together with approximate costs of each. Zinc chloride, applied by the steeping method, costs 2.6 cents and pentachlorophenol applied by cold soaking, costs 2.2 cents per post per year, both giving satisfactory results and needing no special equipment. The possibility of communal or small-scale commercial treating plants is discussed.

[519]. 33.36.1 : 33.54 : 12.25. WALTERS, C. S. **Preservative treatment of White Pine fence posts at low temperatures.** *J. For.* 46 (3), 1948 (180–3). 5 refs.

Fifty round Eastern White Pine [*P. strobus*] posts were peeled, dried, and cold-soaked for 144 hours in a 5% solution of pentachlorphenol in light fuel oil. Temperatures ranged between – 18 and 22° F. for the air and 14 and 26° for the treating solution. Complete penetration of the sapwood was effected by the end of 48 hours. Absorption of preservative solution at the end of 48 hours was 2·90 lb./cu. ft. and

by 144 hours 3·70 lb. Results were about the same as those reported by the Forest Products Laboratory in similar treatments conducted at room temperatures of 70–80° F. *From author's summary.*

[520]. 33.36.1 : 33.54 : 33.31 : 12.26–8. **Preservative treatment of Tamarisk fence posts.** *Rep. Ariz. agric. Exp. Sta. 1946*, 1947 (19–20).

For earlier reports on this project see *For. Abstr.* 5 (p. 180). As a result of further tests, the use of wood-tar creosote is not recommended for treating fence posts of *Tamarix aphylla*; though it contains toxic components, they are relatively water-soluble and are lost in solution in the soil water or are volatilized. Pentachlorphenol solutions are promising and may give fence posts as long life as the best coal-tar creosote at far less cost.

[521]. 33.36.1 : 33.8. **Report of committee 7–11. Uses of treated wood for car lumber.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (249–52); 43, 1947 (330–4).

Includes lists of parts of railway rolling stock for which treated timber has been used. [Cf. *For. Abstr.* 8 (No. 464).]

[522]. 33.36.1 : 33.8. BRENTLINGER, P. D. **The use of treated car lumber by the railroads.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 7. P.R.

Gives figures showing the average life of untreated and treated timber in railway trucks and wagons and the causes (decay and other) of failure of untreated timber. Discusses the preservatives suitable for different parts and gives the specification requirements for pressure treatment laid down by one railway company.

[523]. 33.36.1 : 31.44. **Report of committee 7–10. Diversified uses of treated wood.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (255–65); 43, 1947 (317–29).

(1) The 1946 report enumerates new uses of treated wood. Research on the acid resistance of wood has shown that the temperature of the acid is of great importance. The life of untreated wood decreases 5–6 days for every 1° C. rise in temperature of a 30% HCl solution. Above approximately 35° C. the use of material other than wood is advisable. Southern Cypress or Longleaf Yellow Pine are the best species for use in contact with acid; Sitka Spruce, Red Cedar and Redwood next. Within any species the higher the dry-weight density, the greater the resistance to HCl. Niggerizing, i.e. impregnation with a coke-oven coal tar having a viscosity between 1,250 and 1,450 Saybolt seconds at 200° F., a flash point of 270–310° F. and a fire point of 335–375° F., is the best treatment for raising acid resistance and will increase the strength life of wood subjected to HCl solutions by 150–175%. The HCl corrosion resistance of niggerized wood can be raised 50–100% by giving a 10- to 15-second dip coating of hot asphalt of 20–30 penetration (ASTM standard). During the war the company making these researches treated Ponderosa Pine (the only wood then available) with 135–137° paraffin at 200° F. and 60 lb. pressure for 5 days, resulting in complete impregnation, whereas with coal tar they could get only about $\frac{1}{4}$ in. penetration. The wood was used for acid tanks, but paraffin treatment, because of its lack of permanence, is not suitable against high-temperature acid. [Cf. *For. Abstr.* 10 (No. 387).]

(2) The 1947 report notes further new uses and gives supplementary information on known uses of treated timber.

[524]. 33.36.1 : 33.91 : 52.43.2. **Report of committee 5–9. Inspection—with discussion.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (169–74).

A discussion of the application to Douglas Fir of correction factors in tentative Standard 14*c* for the butt-tip method of measuring round forest products in lengths of over 80 ft. [cf. *For. Abstr.* 8 (No. 490)]. Among other amendments a new paragraph on the retention of preservatives is included in the adopted Standard 33*d*. This states that when maximum possible retention by the full-cell process is specified, pressure and temperature shall be maintained or increased until the quantity of preservative absorbed is not more than the following percentages of the amount already injected:—all species except Douglas Fir and Oak, $\frac{1}{2}$% in any half hour; Douglas Fir and Oak, 2% in each of any two consecutive half hours.

[525]. 33.36.1 : 33.91 : (73) : 33.53 : 12.25 : 52.43.2 : 35 : 31.1 : 01.4. **Report of committee 5–9. Inspection.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (190–2).

Additional data on estimating standard volumes of Douglas Fir piles and poles over 80 ft. long. Variations in results of measurements by the butt-tip method indicate the inadvisability of setting a conversion factor before collecting further data. The data show that volumes obtained by the use of mid-point diameters and the tables set out in standard 14*d* give reasonably accurate results and this standard (together with tentative standard 2*f* concerning the purchase and preservation of forest products) was adopted. Several chemical stains for determining heartwood and sapwood of various commercial species were investigated. Testing with benzidine is satisfactory for all species of Pine. Further research is recommended on the use of a 10% ferric-chloride solution for Douglas Fir and Benzo Yellow pH indicator for Oak.

33.36.2. *Fireproofing*

See also *For. Abstr.* 10 (Nos. 469, 495–7).

[526]. 33.36.2 : 33.31. DEUTSCHE SOLVAY-WERKE A.G., ZWEIGNIEDERLASSUNG ALKALI-WERKE, WESTEREGELN, BEZ. MAGDEBURG. Imprägnierungsmittel für brennbare Stoffe. **[Impregnating agent for combustible material.]** *Ger. Patent* No. 717,943, Feb. 26, 1942. *Prev. Deterior. Abstr.* 3 (5), 1947 (W.57). D.S.I.R.

An aqueous emulsion of technical monochloronaphthalene with fire-retardant salts such as inorganic acetates, ammonium bromide, or ammonium phosphates imparts fire resistance. Although monochloronaphthalene is itself easily inflammable, it is claimed that when mixed with these salts it will give better protection than either the salts alone or the salt with polychloronaphthalenes added to them. It is claimed that one of the main advantages of monochloronaphthalene is its great capacity for penetrating wood, which makes impregnation unnecessary and permits application by dipping and even by painting.

[527]. 33.36.2 : 33.31 : 07.2 : 01.4. MCFARLAND, W. A. **Plant control and inspection of fire-retardant treatment.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (305–17).

Methods of analysis for four compounds commonly used in flame-proofing wood—boric acid, sodium tetraborate, ammonium phosphate and ammonium sulphate—with methods for determining the penetration of fire-retardants.

[528]. 33.36.2 : 07.2 : 01.4 : 31.25. **Report of committee 9. Fireproofing. Appendix A. Some data on the effect of specific gravity on fire-tube test and special-crib test results.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (362–9).

Results obtained from the fire-tube and crib test methods of estimating fire resistance vary with the specific gravity of the specimens. The heavier the specimen, the lower the weight loss when expressed as a percentage of the original weight. The effect of specific gravity is less, however, when specimens are cut before, than when they are cut after, treating.

[529]. 33.36.2 : 33.4. HARKOM, J. F. **Fire-retardant treatment of structural timbers.** *Mimeo. For. Prod. Lab., Can.* No. 110, 1946. pp. 4. P.R.

[530]. 33.36.2 : 33.4 : 33.15.2 : 31.45. **Fire resistance of heavy timber construction.** *Journal of the Franklin Institute* 241 (6), 1946 (442). L.S.

Experiments at the U.S. National Bureau of Standards with heavy timber-construction floors show that, with a 1-in. finish floor on top, the fire resistance of laminated floors of 4-in. planks on edge averages 45 min.; with floors of 6-in. planks, it averages a little over an hour; and with 8-in. planks, about 1½ hours. When the structural portion of the floor is of tongued-and-grooved planks of 3-in. nominal thickness laid flatwise, the fire resistance is approximately 45 min. Impregnation with fire-retardant chemicals increased the fire resistance of 4-in. laminated floors by about 15 min. A similar increase was obtained with a heavy coating of a fire-retardant compound applied to the lower surface.

[531]. 33.36.2 : 33.4 : 12.25. MITCHELL, N. D. **Fire tests of treated and untreated wood walls.** *Proc. Amer. Wood-Pres. Ass.* 43, 1947 (353–60). 5 refs.

Solid Douglas Fir walls, 4 and 6 in. thick (both untreated and after fire-retardant treatment) were tested for fire endurance, some specimens under load and others without load. The fire-retardant treatment added 20 to 24% to the resistance of the walls tested under load and 29 to 33% to the resistance of walls tested

without load, based on the time of resistance of the untreated walls.

[532]. 33.36.2 : 33.15.2 : 12.25. **Fire test on treated Douglas Fir plywood [7-ply doors treated by the 'Oxylene' process].** *Timber News* 54 (2090), 1946 (442–4). P.R.

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 10 (Nos. 347, 643).

[533]. 33.36.3 : 07.7. RASMUSSEN, E. F. **Kiln tune-ups to correct non-uniform kiln-drying conditions.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1644, 1947. pp. 8. P.R.

Lists some of the defects in heating, humidifying, venting and air-circulation systems which are possible factors in lack of uniformity in drying conditions.

[534]. 33.36.3 : 07.7. RASMUSSEN, E. F. **Analysis of problems relating to uniformity of kiln control.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1645, 1947. pp. 8 + 3 dgms. P.R.

[535]. 33.36.3 : 07.7. RASMUSSEN, E. F. **Types of steam-heating systems, flow of steam, cause and effect of air and water binding, importance of steam traps, steam pressure, and heat transfer in lumber dry kilns.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1663, 1947. pp. 7 + 5 dgms. P.R.

[536]. 33.36.3 : 07.7. KIMBALL, K. E. **Steam traps.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1664, 1947. pp. 5 + 3 dgms. P.R.

Describes the construction of various types of traps to remove condensate collecting in the pipes of steam-heated kilns, and lists some of the factors that affect their efficiency.

[537]. 33.36.3 : 07.7 : 01.4. LOUGHBOROUGH, W. K. **Moisture equalizing, stress conditioning, and sterilizing treatments in kiln drying lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1652–c, 1947. pp. 7 + 2 gphs. P.R.

[538]. 33.36.3 : 07.7 : 31.22.1. SMITH, H. H. **Relative humidity and equilibrium moisture content graphs and tables for use in kiln drying lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1651, 1947. pp. 4 + 3 gphs. + 1 tbl. P.R.

Illustrates the construction and use of graphs and tables in kiln seasoning.

[539]. 33.36.3 : 07.7. TORGESON, O. W. **Effect of piling methods on air circulation in a lumber dry kiln.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1653, 1947. pp. 5. P.R.

[540]. 33.36.3 : 12.25–8. **Kiln - drying schedules.** *Leafl. For. Prod. Res., Lond* No. 42, 1948. pp. 10. 8 tbls.

Gives 8 kiln schedules and a list of approximately 200 commercial species, with the schedule recommended for each.

[541]. 33.36.3 : 33.12 : 12.26–8. SMITH, H. H. **Kiln drying of White Birch turning squares.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1702, 1947. pp. 8 + 2 gphs, 3 tbls. P.R.

[542]. 33.36.3 : 12.26–8. SMITH, H. S. **Seasoning of Aspen [*Populus tremuloides*].** *Lake St. Aspen Rep.* No.5, 1947. pp. 19. 16 refs.

[543]. 33.36.3 : 07.7 : 01.1. BRAJNIKOFF, B. J. **The theory of dielectric heating.** *Timber News* 56 (2105), 1948 (95–6).

Discusses the factors affecting the amount of energy absorbed by wood in high-frequency drying and gives a formula for determining the power output; discusses the effect of an alternating current and of the power loss of the dielectric. [Cf. *For. Abstr.* 10 (Nos. 391–2, 485).]

[544]. 33.36.3 : 07.7 : 33.15. BRAJNIKOFF, B. J. **Wood improvement by dielectric heating.** *Timber News* 56 (2104), 1948 (49–50, 59).

[545]. 33.36.3 : 33.31. **Special methods of seasoning wood: chemical seasoning.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1665–6 [1947], pp. 2. 4 refs. P.R.

[546]. 33.36.3 : 01.4 : 33.52 : 33.53. HUDSON, M. S. **Vapor drying: the artificial seasoning of wood in vapor of organic chemicals.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 23. 16 refs. P.R.

[547]. 33.36.3 : 01.4. [HERMANN, A.] **Special methods of seasoning wood; solvent seasoning.** *Sth. Lumberm.* 176 (2211), 1948 (88). 4 refs.

The Western Pine Association has carried out research on solvent seasoning at Bend, Ore.,

and has developed a process which is said to be effective both for seasoning and for 'pitch' removal. The lumber is stood on end in a closed drying chamber and continuously sprayed with hot acetone until most of the water is removed. The acetone containing both water and the 'pitch' from the wood is continuously drained away and recirculated through a storage tank and heater back to the spray head. When the water content of the mixture becomes too great, some of the mixture is drawn off from the storage tank and distilled to recover pure acetone. The second step in the drying process consists in fanning heated air over the lumber to complete the drying and remove the acetone. It is estimated that Ponderosa Pine can be dried by this method in $\frac{1}{2}$–$\frac{1}{4}$ the time required for kiln drying. Drying is slower and 'pitch' recovery less for heartwood than for sapwood and it is probable that the process would not be as rapid with other woods as with Pine sapwood. The process apparently does not reduce the strength of the wood. Further information may be obtained from the Western Pine Ass. Research Laboratory, 7733 SE 13th Ave., Portland, Oregon.

[548]. 33.36.3 : 31.8. BAKER, W. J. **Drying stresses in lumber seasoning.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1652 1947. pp. 8 + 1 gph. P.R.

Describes the causes of tension and compression set up during drying, analyses the stress distributions existing during seasoning at 6 different periods over 51 days in a 2- × 10-in. flat-grained Sweetgum hardwood plank, and discusses the defects caused by drying stresses.

33.36.5. *Steaming*

[549]. 33.36.5 : 12.26–8. **Steaming Black Walnut lumber to darken the sapwood.** *Sth. Lumberm.* 176 (2205), 1948 (82). [U.S. For. Prod. Lab., Madison.]

33.37-8. Destructive Distillation. Charcoal and By-Products. Use of Wood and Charcoal for Gas Manufacture

See also *For. Abstr.* 10 (No. 787).

[550]. 33.37 : 01.4. ARIES, R. S. **Recent developments in the production of charcoal and its by-products.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 15, 1947 (25–43). L.S.

A description and evaluation of modern wood-distillation methods such as the Reichert process and the circulating-gas process of Strupp. The recovery of by-products by the Suida, Othmer and liquid-liquid extraction procedures and the production of food preservatives from pyroligneous liquors is also briefly considered. [Cf. *For. Abstr.* 9 (Nos. 441, 1765–6).]

[551]. 33.37 : 01.4. MELAMID, M. **Production of wood tar and charcoal by successive direct and indirect heating steps in a kiln.** *U.S. Patent* No. 2,429,272, Oct. 21, 1947. *Chem. Abstr.* 42 (1), 1948 (348). P.R.

The kiln, preferably constructed of concrete mixed with asbestos fibres, is charged with pieces of resinous wood piled under a heat-resisting cover. The pre-heating inside the kiln is done by covering the resinous wood with less valuable wood. When the temperature of about 200° C., at which discharge of tar usually begins, is reached, external heat is supplied to the kiln, usually by burning inexpensive wood on its cover. The yield of tar per unit of wood is increased by about 50%, since it is not necessary to burn and waste part of the resinous charge to create the necessary heat. After discharge of tar is completed, air is admitted to the kiln and external heat discontinued. Thus complete carbonization of the wood is accomplished and charcoal of good porosity obtained.

[552]. 33.37 : 12.25 (471). ENKVIST, T., MÄKELÄ, K., and KROHN, T. **Lubricating oil from Pine tar and tall oil. 1. The composition of oven Pine stump tar from the plant of Maavesi.** *Papp. Trävarutidskr. Finl.* 29 (22; 23), 1947 (336–8; 353–6). 14 refs. [E.e.] P.R.

[553]. 33.37 : 07.7 (51). LEE, R. E., TSU, S. T., and KOIDA, Y. T. **Report on recovery of by-products from the native charcoal kiln.** *Bulletin, National Bureau of Industrial Research, China* No. 141, [*n.d.*] pp. 12. [Chin.e.] P.R.

Describes a simple condensing apparatus for use with the native 'Horse-shoe' kiln. An average of 14% charcoal and 0·42% acetic acid by weight of the wet wood is obtained.

[554]. 33.37 : 12.26–8 : 07.7. TWINING, R. H. **Modernization of hardwood distillation.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 15, 1947 (5–19). L.S.

A discussion of ways to improve charcoal manufacturing methods. Small blocks between 1 and 1¼ in. thick are the most suitable and economical size of wood for destructive distillation. A special band-saw and splitter have been designed to reduce wood to these dimensions without excessive loss in sawdust. Retorts and pre-dryers must be adapted to meet the special conditions of the installation.

[555]. 33.37 (47). CHALOV, N. V. Proizvodstvo lesokhimikatov utilizatsiey pobochnÿkh produktov gazifikatsii drevesinÿ. **[Production of chemicals from by-products in the manufacture of wood-gas.]** *Lesnaya Prom.* 1947 (9), (17–19). [Russ.]

See *For. Abstr.* 9 (p. 540). According to an incomplete census of 1944–45, 31 generator plants in the U.S.S.R., chiefly serving steel and glass factories, consume 3·5 million cu.m. of wood (1·72 million as chips, the rest as billets) annually. Observations at two plants showed good prospects for the recovery of chemical by-products, the yields of which would exceed those obtained in the industrial dry distillation of wood by 74–102% for wood tar and 14–65% for acetic acid, though the yield of methyl alcohol would be 20% less. It had been widely held that gas for metallurgical purposes should be used unpurified, in order to utilize to the maximum the heat energy of its constituents. Further, the consumption of wood per metric ton of steel produced had been shown to be halved by reducing its moisture content from 56–60 to 30%, but drying to this extent could not be done economically.

This problem was successfully overcome by drying and cleaning the gas in scrubbers. The wood should be used as chips, as these give almost double the yield of chemical by-products, cost about ¼ as much to prepare for use and yield a gas of 50% higher calorific value, as compared with wood in the form of billets. The conversion of a gas generator station to operation on chips, with cleaning and drying of the gas, gave a gas of calorific value 1,500 Cal./cu.m., reduced wood consumption per metric ton of steel produced from 3·3 to 1·25 cu.m., and doubled the output of the Martin furnaces.

Improvements were also obtained by using chips and drying the gas in generators supplying glass factories. In this case the consumption of wood remained the same and no more than 6·5% of the oven-dry weight of the wood was removed as tar, the remaining tar being returned to the generator, though all the acetic acid, methyl alcohol and other by-products were utilized.

The yields of commercial wood tar (30% water) and commercial calcium acetate are respectively 87 and 17 g. per cu.m. of gas produced.

Financial calculations show that in this process the by-products were obtained practically gratis.

[556]. 33.38.1. WETTERHOLM, A. **Yields and characteristics of charcoal produced at different temperatures.** *Handl. Ing-VetenskAkad., Stockh.* No. 183, 1945. pp. 43. 26 refs. [E.e.] P.R.

Reviews earlier experiments in the same field. Discusses the main factors affecting the composition of charcoal, namely: final temperature; rate of heating, heating period after the final temperature is reached; pressure; moisture content of the wood; apparatus; and length of storage in air. Describes and expresses in graphs and tables the results of experiments to ascertain the ash content and moisture content of wood and charcoal, volatile substances, carbon and hydrogen content, and heat value of charcoal from *Alnus glutinosa* and *Rhamnus frangula*. The temperature (at 100° intervals to 1000° C.), degree of carbonization and carbon content have been selected as independent functions for the different graphs.

[557]. 33.38.1 : 34.6 : 33.1 : 12.25. ROSS, J. D. **Carbonization of Douglas-Fir sawdust.** *B.C. Lumberm.* 32 (4), 1948 (64–5, 78). 5 refs.

The Oregon Forest Products Laboratory, in 1943, inaugurated research to determine the feasibility of producing charcoal from sawdust. The installation used is described and the nature of the products analysed. It is concluded that the prospects of producing softwood charcoal on a commercial scale are promising.

[558]. 33.38.3 : 33.38.1 : 01.4. TWINING, R. H. **Activated carbon as a wood product [uses and methods of manufacture].**

Bull. Ntheast. Wood Utiliz. Coun. No. 15, 1947 (45–54). 1 ref. L.S.
Cf. *For. Abstr.* 9 (No. 1150).

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

See also *For. Abstr.* 10 (No. 428).

[559]. 33.39 : 34.6 : 33.1. KREBS, E. T. **Wood shavings for use in the rapid maturation of alcoholic liquors.** *U.S. Patent* No. 2,417,505, March 18, 1947. *Chem. Abstr.* 41 (16), 1947 (5258). P.R.

Gives a method for treating wood, preferably Oak shavings and chips, under conditions which accelerate the growth of naturally occurring fungi into the production of materials valuable in the rapid maturing of alcoholic liquors.

[560]. 33.39 : 34.6 : 33.1 (73). KURTH, E. F. **The utilization of wood waste by fermentation processes.** *Chemurg. Dig.* 6 (24), 1947 (361–3). 9 refs. P.R.

[561]. 33.39 : 01.4. BENDER, F. **Wood hydrolysis at atmospheric pressure.** *Mimeo For. Prod. Lab., Can.* No. 108, 1945. pp. 6 + 1 dgm. P.R.

Tabulated results of experiments in the hydrolysis of acid-moistened sawdust subjected to a hot gas atmosphere show a yield of up to 8·4% reducing sugar in 120 seconds and justify experiments on a larger scale.

[562]. 33.39 : 01.4 : 12.25. HARRIS, E. E., and LANG, B. G. **Hydrolysis of wood cellulose and decomposition of sugar in dilute phosphoric acid.** *J. phys. colloid Chem.* 51 (6), 1947 (1430–41). 18 refs. D.S.I.R.

Describes and discusses the results (expressed in graphs and tables) of the hydrolysis of Douglas Fir cellulose, using phosphoric and sulphuric acids. Concludes that: (1) within the temperature range 180–195° C. phosphoric acid in concentrations of 0·2–3·2% is less suitable than sulphuric acid for hydrolysis; (2) the rate of hydrolysis of cellulose and of the decomposition of glucose is a function of the pH and not of the acid concentration; (3) yields of sugars in wood hydrolysis should be higher with the use of higher concentrations of acids; (4) equal yields may be obtained at lower temperatures with higher concentrations of acid; and (5) higher yields of sugar should result from the use of higher temperatures for hydrolysis, provided that the sugars can be removed as soon as they are produced.

[563]. 33.39 : 01.4. BOEHM, R. M., and HALL, H. E. (to Masonite Corporation). **Treatment and clarification of wood-sugar solutions.** *U.S. Patent* No. 2,431,163, Nov. 18, 1947. *Chem. Abstr.* 42 (4), 1948 (1382). P.R.

[564]. 33.39. LEONARD, R. H., PETERSON, W. H., and RITTER, G. J. **Butanol-acetone fermentation of wood sugar.** *Industr. Engng. Chem.* (*Industr. Ed.*) 39 (11), 1947 (1443–5). 12 refs. P.R.

Wood hydrolysates were fermented with *Clostridium butylicum* No. 39 to butanol and acetone. The wood species and method of hydrolysis affect the fermentability of the liquors. Complete utilization of sugar could be obtained at up to 3% concentrations. Solvent yields ranged from 24 to 38% of the sugar fermented. *Authors' summary.*

[565]. 33.39 : 33.32.1 : 34.6. MCCARTHY, J. L. **Preparation of sulfite waste liquor for fermentation.** *U.S. Patent* No. 2,430,355, Nov. 4, 1947. *Chem. Abstr.* 42 (2), 1948 (761–2). P.R.

Sulphite waste liquor is heated to 100° [C.] and treated with steam in a countercurrent manner to remove SO_2 and reduce the pH to 3–5. It is then suitable for fermentation or the growth of yeast.

[566]. 33.39 : 33.3 : 34.6. ROSTEN, M. M. **Alcohol and food yeast from waste sulphite liquor [: historical survey and discussion of economic aspects].** *Bull. Ntheast. Wood Utiliz. Coun.* No. 12, 1946 (179–86). 6 refs. L.S.

33.4. *Converted Structural Timber*

See also *For. Abstr.* 10 (Nos. 279, 500–02, 504–5, 529–31, 589–91, 649, 651).

[567]. 33.4 : 12.26–8 : 31.0. REES, L. W. **Aspen [*Populus tremuloides*] lumber for building purposes.** *Lake St. Aspen Rep.* No. 9, 1947. pp. 11. 13 refs.

[568]. 33.4 : 33.15.2 : 31.27. HANSEN, H. J. **Design of plywood I-beams.** *Proceedings, American Society of Civil Engineers* 72 (6), 1946 (749–58). 3 refs. D.S.I.R.

Gives formulae, graphs and tables for use in determining the design and dimensions of plywood I-beams in relation to different stresses, and suggests a method, based on the application of a formula for isotropic materials, of determining suitable spacing for web stiffeners.

[569]. 33.4 : 38.2 : 38.3. GABER, E. **Economical timber beams. A contribution to timber construction of high bearing capacity.** *Transl. Minist. Wks., Lond.* No. 6, 1945. pp. 26 + 8. From *Mitt. Fachaussch. Holzfr.* No. 27, 1940. P.R.

Discusses the construction, use and bearing capacity of I-beams and hollow beams in houses and of timber lattice girders for bridges.

[570]. 33.4 : 38.2 : 33.15.5. GRAF, O., and EGNER, K. **Investigation of economical beams with special reference to their use in house constructions.** *Transl. Minist. Wks., Lond.* No. 8, 1945. pp. 69. 24 refs. P.R.

Describes and discusses the results of bending and fatigue tests on built-up beams, (1) bonded by cold gluing process, (2) bonded by hot gluing process and (3) joined by mechanical means (wire nails, and round dowel connexions).

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

See also *For. Abstr.* 10 (Nos. 322, 413, 500–01, 504–20, 524–5, 546).

[571]. 33.51 : 12.21 : 31.42.1 : 33.36.1 : 91.4. BROWN, R., WEINTROUB, D., and SIMPSON, M. W. **Timber as a source of sporotrichosis infection.** In *Sporotrichosis Infection on Mines of the Witwatersrand*, Transvaal Chamber of Mines, Johannesburg. 1947 (5–28 + 8 photos). 11 refs.

Sporotrichum beurmanni (the causative organism of sporotrichosis in man) has been found over 60 times on timber in goldmines on the Rand. It occurs on sound, untreated timber. Experiments were carried out to determine whether its growth is restricted to certain species or to certain parts of the timber (i.e. sapwood or heartwood). The species tested included a number of Eucalypts, *Acacia mollissima*, *Pinus patula*, *P. radiata*, *P. pinea*, *P. palustris*, *Baikiaea plurijuga*, *Erythrophloeum guineense*, *Brachystegia* spp., and *Pseudotsuga taxifolia*. The last-named species was the only one tested which did not sustain any growth of the fungus. Growth was excellent on the sapwood of most of the species, with the exception of *P. palustris*, where it was feeble and sparse. Growth on heartwood was generally much poorer. It was demonstrated that the fungus can be dispersed by air but that the principal agents of dissemination are water and insects. Viability tests showed that after being dry for 24 months, a percentage of spores are still both viable and virulent. The results indicate that where well seasoned timbers are used, which are not influenced by any moisture other than that of the atmosphere, they will not sustain growth of the pathogen unless the relative humidity is between 100 and 95%. It has been demonstrated that some commonly occurring basidiomycetes destroy *S. beurmanni* in the process of their attack on wood. Observations made underground indicate that it does not occur on timber treated with 'Yard Mixture' (3% zinc sulphate (anhydrous) and 0·3% triolith (a Wolman salt containing sodium fluoride, dinitrophenol and potassium bichromate)). Spraying timber *in situ* with 'Yard Mixture' or 'Dowicide' was effective in killing the fungus.

[572]. 33.51 : 31.0 (91). SPOON, W. Indisch hout voor leidboomen in mijnschachten. **[Wood from the Netherlands Indies for guide piles [used to guide the cage in the shaft] in mine shafts.]** *Ber. HandMus. kolon. Inst. Amst.* No. 205, 1944. pp. 8. 7 refs. [Du.]

Concludes that, while Oelin (*Eusideroxylon zwageri*), Bangkirai (*Shorea laevifolia*) and Kroewing (*Dipterocarpus* spp.) are generally technically and economically suitable, all three timbers are too hard for the normal claw-type emergency brake used on the lift-cage.

[573]. 33.51 : 31.27. CRESTIN, F. Essais mécaniques sur bois de mines. **[Mechanical tests on mining timber.]** *Rev. Eaux For.* 86 (1), 1948 (33–45). [F.]

The tests reported earlier [cf. *For. Abstr.* 8 (No. 1288)] were on (1) poles stored under

cover, (2) poles stored off the ground but fully exposed to the weather for 6 months, (3) poles stored as in (2) but for 12 months. The present report is on a 4th series stored as in (2) and (3), but for a period of 2 years. The tests are reported in detail. The general conclusion from all tests is that in comparison with series (3) the further 12 months' storage resulted in very little modification of maximum bending strength, but a considerable reduction in elasticity, in work done to maximum load and total work.

[574]. 33.52 : 31.41 : 12.26–8 (81). HORN, F. **Durability of Brazilian crossties.** *Trop. Woods* No. 93, 1948 (30–5).

Gives test results on sleepers of 7 species of Amazonian hardwoods in Holland, 10 in South Africa, and 10 in Brazil, which indicate that several of these species are very suitable for track use under a wide range of climatic conditions and are equal or superior, in an untreated state, to creosoted Oak sleepers. Only small numbers of sleepers were involved in these tests, which cannot be regarded as conclusive. Though very durable, several species have a tendency to split and do not hold spikes well.

[575]. 33.52 : 31.42.11 : 12.21 : 31.27. KENNEDY, D. E. **The strength and spike-holding quality of Jack Pine ties containing red rot.** *Mimeo. For. Prod. Lab., Can.* No. 111, 1946. pp. 8 + 2 photos, 3 gphs., 5 tbls. P.R.

Describes and tabulates the results of experiments on 30 Jack Pine ties infected with red rot (*Fomes pini*) and concludes that a certain percentage of red rot (varying with the service conditions involved) is permissible.

[576]. 33.52 : 31.42.11 : 12.21 : 12.25 : 31.27. ATWELL, E. A. **Red-stain and pocket-rot in Jack Pine: their effect on strength and serviceability of the wood.** *Circ. For. Prod. Lab., Can.* No. 63, 1948. pp. iv + 23. 14 refs.

Tests were made on Jack Pine [*Pinus banksiana*] sleepers to determine the effect of the red-staining and pocket-rot fungus *Fomes pini* on strength and service life. Sleepers in both the red-stain and pock-rot stages of infection were tested for viability of the fungus before seasoning, after 1 year's seasoning, after creosoting and after various periods of service (both treated and untreated). After felling and during seasoning, *F. pini* loses its viability rapidly, though an unindentified red-staining (but not decaying) fungus (here called Fungus No. 2) becomes more abundant. Creosoting does not kill either fungus except in the areas penetrated by the creosote, but *F. pini* does not advance to the pocket-rot stage of infection in sleepers under service conditions. Both fungi gradually die out in service and any further decay after the sleepers are laid down is usually due to the action of secondary fungi.

Tests were also made to find the effect on strength of *F. pini* and Fungus No. 2. In static bending, the strength of *P. banksiana* containing firm red-stain (without pocket-rot) is not less than that of sound wood. The strength of wood containing up to 10% firm pocket-rot is not much less than that of sound wood. In wood containing more than 10% pocket-rot, the strength decreases gradually. The ability of sleepers with red-stain and pocket-rot to resist withdrawal of spikes follows a pattern similar to that of the strength values.

[577]. 33.53 : 31.42.11 : 12.21 : 12.25 : 31.27. KENNEDY, D. E., and WAKEFIELD, W. E. **The strength of Jack Pine poles infected with pocket rot.** *Circ. For. Prod. Lab., Can.* No. 65, 1948. pp. 22. 6 refs.

Strength tests were made on Jack Pine (*Pinus banksiana*) poles at various stages of infection by pocket rot (*Fomes pini*). Some were tested green, others were dried to 15% moisture content and the bottom 5 ft. then soaked in water for several weeks in order to represent seasoned poles in moist earth. Seasoned poles were weaker than green ones owing to horizontal shear failures caused by seasoning checks. Jack Pine poles having less than 20% pocket rot at ground line are practically as strong as sound poles. Those having 21 to 45% rot at the ground line can be used in pole-line construction so long as appropriate reductions in working stresses are made.

33.6. *Packing Boxes, Crates, etc.*

See also *For. Abstr.* 10 (Nos. 364, 435).

[578]. 33.6 : 12.25 : 31.27. KURTENACKER, R. S. **White Fir crates: a test of the practicability of this wood for fruit and vegetable shipping containers, with conclusions and recommendations made by**

the [U.S.] Forest Products Laboratory. *Mod. Packaging* 20 (9), 1947 (152–5). P.R.

Concludes, from a series of drop-cornerwise and incline-impact tests, that White Fir (*Abies concolor*) is satisfactory for orange boxes and similar crates if: (1) the lumber is properly seasoned to a moisture content of 9–18%; (2) the ends and centre partitions have narrow rails glued along the end-grain surfaces; and (3) the cleated cover unit is made of clear straight-grained White Fir.

33.7. *Firewood*

[579]. 33.7. JENKINS, J. H. **Use of wood for heating logging camps.** *Woodl. Sect. Index Canad. Pulp. Pap. Ass.* No. 962 (B–3), 1948. pp. 12.

[580]. 33.7 : 33.1 : 34.6 : 33.38.1. REINEKE, L. H. **Wood fuel preparation.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–19, 1947. pp. 11. 2 refs. P.R.

[581]. 33.7 : 07.7. REINEKE, L. H. **Wood fuel combustion practice.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1666–18, 1947. pp. 11. 6 refs. P.R.

Discusses the usable heat content of wood in relation to moisture content, the efficiency and principles of combustion of wood fuels, and the design and operation of industrial and domestic furnaces, stoves and fireplaces for burning wood.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 10 (Nos. 351, 356–7, 379–80, 388, 392, 521–2).

[582]. 33.8 : 33.15.2. **All-wood monoplane: details of Newbury Eon.** *Times Rev. Industr.* 1 (11), 1947 (38). P.R.

[583]. 33.8 : 31.27 : 33.4. RADOK, J. R. M., SILBERSTEIN, J. P. O., and WILLS, H. A. **The strength of wooden box spars.** *Rep. Div. Aeronaut. Coun. sci. industr. Res. Aust.* No. SM.84, 1948. pp. 47 + 6 photos, 8 dgms., 15 gphs., 3 tbls. 16 refs. P.R.

Analyses the results of tests on a series of box spars, to provide a basis on which quantitative prediction could be made of the strength of box spars of any solidity and flange ratio and to explain the fact that the modulus of rupture of a solid wooden beam of rectangular section is considerably in excess of the ultimate compressive strength of the material and that the apparent ultimate extreme fibre stress of a hollow or routed section lies between these 2 values. Gives data for use in direct design in the form of semi-empirical curves. Examines also the effect of a superimposed end load arising from beam/column action in certain types of structure.

[584]. 33.8 : 33.15.2. HAGERTY, F. W. **Plywood in boat construction.** *Mech. Engng.* 69 (3), 1947 (213–7). 9 refs. D.S.I.R.

[585]. 33.8 : 33.15.1 : 33.15.2. SHTEYNBERG, Ts. B. Mnogosloynye lyzhi. [**Multi-ply skis.**] *Lesnaya Prom.* 1947 (12), (18–21). [Russ.]

Describes, with diagrams illustrating the jigs and press used, a method of making laminated skis [number of laminations not specified] having hardwood face plies (of Birch, Beech, Oak or Ash) and a core of Pine. The chief virtue claimed for the method is the reduction of waste to a minimum by the cutting of blanks to standard lengths—some full-length and some in lengths suitable for gluing up to make the required sizes—and by gluing up all edgings into suitable widths. The individual laminations, when finally cut to size and shape, are assembled and bonded with casein glue in a pneumatic-hydraulic (hose-type) moulding press taking 24 pairs of skis at a time. The skis are pressed at 4–5 atm. for 4–5 hours; after removal they are held for a further 70–75 hours under tension in a suitable frame. Experiments with a waterproof glue and electric heating of the presses were highly successful, reducing pressing time to 40–50 minutes and eliminating the subsequent setting process necessary with casein glue. Lately, Pine has been successfully substituted for hardwoods in the upper face lamination. It is suggested that with mass production, still better utilization might be achieved by using sliced hardwood laminations for the runner face plies.

[586]. 33.8 : 33.15.2 : 33.15.5. **New plastic adhesive in ski design.** *Timb. & Plyw.* No. 2441, 1948 (619–20). P.R.

[587]. 33.8 : 12.26–8 (71) : 33.53. WAKEFIELD, W. E. **The use of Canadian hardwoods as substitutes for Yellow Locust for**

the manufacture of telephone and telegraph top-pins. *Mimeo. For. Prod. Lab., Can.* No. 109, 1945. pp. 2 + 1 dgm. P.R.

Concludes, as a result of maximum load tests, that Yellow Birch (*Betula lutea*), Beech (*Fagus grandifolia*) and Sugar Maple (*Acer saccharum*) are suitable substitutes for Locust (*Robinia pseudoacacia*).

[588]. 33.8. **The treatment of wooden battery separators.** *For. Prod. News-Lett. C.S.I.R. Aust.* No. 159, 1948 (4).

Describes recommended treatment with caustic soda or sodium salts, and sulphuric acid, for Douglas Fir, Kauri Pine [*Agathis* spp.] and Hoop Pine [*Araucaria cunninghamii*] for use in car batteries, and methods of storage and packing for transport to prevent drying out.

33.9 *Grading [including Standard Specifications] and Storage of Converted Timber*

See also *For. Abstr.* 10
(Nos. 347, 358, 524–5).

[589]. 33.91 (73) : 12.25 : 12.26–8. **Official grading rules for Northern White Pine [*Pinus strobus*], Norway Pine [*Pinus resinosa*], Eastern Spruce [*Picea glauca* and *P. mariana*], Jack Pine [*Pinus banksiana*], Balsam [*Abies balsamea*], Aspen [*Populus tremuloides*], conforming to American lumber standards.** Northern Hemlock and Hardwood Manufacturers Association, Oshkosh, Wis. 1947. pp. 55. P.R.

[590]. 33.91 (73) : 33.4 : 33.12 : 33.13 : 12.25. **Official grading rules for Hemlock and Tamarack lumber, conforming to American lumber standards, and White Cedar shingles.** Northern Hemlock and Hardwood Manufacturers Association, Oshkosh, Wis. 1947. pp. 80. P.R.

[591]. 33.91 (73) : 12.26–8. **Hardwood dimension lumber (second edition).** *Comm. Stand. U.S. Bur. Stand.* No. CS60–48, 1948. pp. 9. P.R.

[592]. 33.91 (73) : 33.15.2 : 12.25. **Douglas Fir plywood (seventh edition).** *Comm. Stand. U.S. Bur. Stand.* No. CS45–47, 1947. pp. 26. P.R.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.1. *Products of the Soil*

[593]. 34.1. Numéro special sur la tourbe. **[Special peat number.]** *Rev. int. Bois* 15 (128/129), 1948 (27–72). [F.]

A special number reviewing actual and possible methods for utilizing peat. It inclues articles on the cutting, drying and briquetting of peat by various mechanical means; the use of peat as a fertilizer, either in a natural state, as ash, or composted; and the draining and cultivation of peat bogs.

34.2. *Vegetable Products*

See also *For. Abstr.* 10
(Nos. 24, 193–4, 255, 734).

34.24. Tanning Materials. Cork. Bark Products

See also *For. Abstr.* 10
(Nos. 296, 417–9, 428, 461–2, 623, 637).

[594]. 34.24 : 31.3. LEWIS, H. F., and BUCHANAN, M. A. **The properties of wood tannins and related materials.** *J. Amer. Leath. Chem. Ass.* 42 (2), 1947 (47–61). L.S.

Summarizes some aspects of recent research on wood chemistry in its relation to tanning, including:—the chemical structure of lignin, the lignans, the tannins (especially Redwood tannin) and the flavonals; the use of ultraviolet absorption curves for establishing the identity of a wood extract; and the modification of lignin to improve its tanning behaviour, either by demethoxylation or by introducing phenolic hydroxyls through appropriate condensation reactions.

[595]. 34.24 : 12.26–8 (81). GUTHEIL, N. C. Tanantes de acácia negra (*Acacia decurrens*, Willd. var. *mollissima*) e suas características no Rio Grande do Sul. **[Tannins from Black Wattle (*A. decurrens*, Willd. var. *mollissima*) and their characteristics in Rio Grande do Sul.]** *Publ. Inst. tecnol. Rio Grande do Sul* No. 4, 1947. pp. 9. [Port.]

Extracts of the pods of *Acacia decurrens* var. *mollissima* from trees of various ages and from various parts of Rio Grande do Sul were analysed for their tannin, non-tannin and sugar content and the figures compared with

those of extracts from Africa, Australia, Argentina, California and São Paulo. The average tannin content for trees of 5–8 years in Rio Grande do Sul was about 35–37%. The effect of pH on the oxidation of tannin solutions exposed to the air was studied and found to attain its maximum at pH 9·0.

[596]. 34.24 : 12.26–8 : 34.27. BELLOUARD. Le Gonakié, source de matières tannantes. [***Acacia scorpioides*, a source of tannin.**] *Bois For. Trop.* 5 (1), 1948 (45–9). [F.]

An account of the tree and analysis of the contents of the pods, which include 43·6% tannin when young and 21·5% when mature. An analysis of the forage value of the seeds is also given.

[597]. 34.24 : 12.26–8 : 76. MCCLAY, T. A. **Profits from Chestnut Oak [*Quercus montana*] tanbark.** *J. For.* 46 (4), 1948 (298–9).

[598]. 34.24 : 12.26–8 : 09.4 : 35 : 98 : 21. PALMGREN, E. **Cork production and international cork trade.** International Institute of Agriculture. Temporary Bureau in Europe of F.A.O., Rome. 1947. pp. 158 + map. 134 refs.

A brief general account of cork production and manufacture is followed by detailed studies of production and trade in the principal cork-producing countries—Portugal, Spain, Spanish and French Morocco, Algeria, Tunisia, France and Italy. Statistical data on world imports and exports of cork and cork products between 1925 and 1946 are given.

[599]. 34.24 : 12.26–8 (46) : 23.1. STOCKWELL, P. **The culture of Cork Oak in Spain.** *Econ. Bot.* 1 (4), 1947 (381–8).

An account of the methods of exploitation, supply and present production, and the factors adverse to regeneration (grazing swine, charcoal burning, injuries caused during stripping).

[600]. 34.24 : 12.26–8 (81). ALMEIDA, D. G. DE. **Tests of some corks from Brazil.** *Trop. Woods* No. 93, 1948 (40–8 + 10 photos).

Tests were made on material from the following Brazilian cork-producing trees:—*Aspidosperma tomentosum*, *Enterolobium ellipticum*, *Fagara* sp., *Agonandra brasiliense*, *Aegiphila* sp., *Pisonia tomentosa*, *Kielmeyera coriacea*. The results are given in detail. Though none of them are as good as the best Portuguese cork, it would be possible to select from among the different kinds of Brazilian cork, the one best suited for each specific use.

34.25. Christmas Trees. Medicinal and Edible Plants

See also *For. Abstr.* 10 (Nos. 124, 623, 632).

[601]. 34.25 : 12.26–8. GARCIA, F. **Distribution of insulinlike principle in different plants and its therapeutic application to a few cases of Diabetes mellitus.** *Philipp. J. Sci.* 76 (3), 1944 (3–19). 4 refs.

Includes notes on the use of bark and leaves of *Lagerstroemia speciosa* and *Syzygium cumini* in treating diabetes.

[602]. 34.25 : 12.26–8 (728) : 34.26 : 34.27 : 23.6. SIERRA, H. M. El piñón. [***Jatropha curcas.***] *Rev. agric., Guatemala* 2 (21/26), 1946 (353–4). [Span.] E.M.B.

A brief account of *Jatropha curcas*, valuable as a producer of seed-oil [cf. *For. Abstr.* 8 (No. 2673)], and medicinal products. It is also widely used for hedging, as the foliage is unpalatable to cattle and it propagates readily in the dry season by means of suckers.

[603]. 34.25 : 12.26–8 : 12.11.11. WILDEMAN, É. DE, and PYNAERT, L. À propos de médicaments antilépreux d'origine végétale. XI. Sur des représentants des genres: *Bauhinia*, *Caesalpinia*, *Cicer*, *Cynometra*, *Entada*, *Erythrophleum* de la famille des Léguminosacées. [**On medicines of vegetable origin used for leprosy. XI. On representatives of the genera *Bauhinia, Caesalpinia, Cicer, Cynometra, Entada, Erythrophleum* of the family Leguminosae.**] *Bulletin des Séances de l'Institut Royal Colonial Belge* 17 (2), 1946 (650–707). [F.] L.S.

[604]. 34.25 : 12.26–8 : 21.2 : 12.11.11. LOUSTALOT, A. J., WINTERS, H. F., and CHILDERS, N. F. **Influence of high, medium and low soil moisture on growth and alkaloid content of *Cinchona ledgeriana*.** *Plant physiol.* 22 (4), 1947 (613–9). [Federal Experiment Station, U.S. Department of Agriculture, Mayaguez, Puerto Rico.] O.B.D.

Seedlings of *Cinchona ledgeriana* were grown in soils of high, medium and low moisture content in order to study the effects on growth

and alkaloid content. Seedlings in soils of high moisture content developed symptoms resembling manganese deficiency or toxicity. Their nitrogen, phosphorus and potassium contents were higher than those of plants grown in lower soil moistures. Seedlings grown in soils of low moisture content were shorter, with a lower top/root ratio and less fresh and dry weight, but they had a higher percentage of dry matter than the other two classes. Total alkaloid and quinine sulphate in roots of seedlings grown in medium and high soil moistures were significantly higher than those in roots of seedlings grown in low soil moisture. Percentages of ash, calcium and magnesium were highest in plants grown in low soil moisture. *From authors' summary.*

[605]. 34.25. HARTZELL, A. **Additional tests of plant products for insecticidal properties and summary of results to date.** *Contr. Boyce Thompson Inst.* 15 (1), 1947 (21–34). 54 refs.

Acetone extracts of products of 400 species and varieties of plants representing 102 families were tested on mosquito larvae (*Culex quinquefasciatus*) under laboratory conditions. Included among the 10 species of plants the products of which, exclusive of essential oils and rotenone, possessed the greatest toxicity to mosquito larvae, expressed as median lethal dose (L.D.50) in p.p.m., were the following: Balm of Gilead [*Populus tacamahaca*?], 5·8; *Pinus taeda* seed, 34; *Pinus virginiana* seed, 56. *From author's summary.*

[606]. 34.25. ROARK, R. C. **Some promising insecticidal plants.** *Econ. Bot.* 1 (4), 1947 (437–45).

Includes notes on *Amorpha fruticosa*, *Pinus palustris*, *Phellodendron amurense*, *Xanthoxylum clava-herculis*, *Aeschrion excelsa*, *Quassia amara*, and *Duboisia hopwoodi*.

[607]. 34.25 : 12.26–8. SEIFERLE, E. J., and FREAR, D. E. H. **Insecticides derived from plants.** *Industr. Engng. Chem.* (*Industr. Ed.*) 40 (4), 1948 (683–91). 194 refs. P.R.

Discusses research on the chemical constituents and effects of various plant insecticides, including extracts of the bark and wood of *Quassia amara*.

[608]. 34.25 : 12.26–8. Produits insecticides tirés de deux plantes tropicales *Mammea* et *Melia azedarach*. **[Insecticides from 2 tropical plants: *Mammea* and *Melia azedarach*.]** *Rev. int. Bot. appl. Agric. trop.* 27 (295 6), 1947 (235–6). P.R.

34.26. Resin. Turpentine. Oils. Gums. Latex, etc.

See also *For. Abstr.* 10 (Nos. 602, 637, 845).

[609]. 34.26 : 07.2. STAFFORD, R. W., and WILLIAMS, E. F. **The analysis of resins.** In *Protective and Decorative Coatings*, Vol. V. John Wiley & Sons Inc., New York. Chapman and Hall Ltd., London. 1946 (1–174). L.S.

Resins are classified according to their chemical composition and an analysis of each is given. Methods of analysis and physical and chemical methods of treating resins are also dealt with.

[610]. 34.26 : 12.25 : 12.11.11. RUDD, H. W. **The chemistry of the natural varnish resins.** *Paint Mfr.* 14 (7; 8), 1944 (191–5; 227–30). 44 refs. D.S.I.R.

[611]. 34.26 (73). EVERARD, W. P., *et al.* **Modern turpentining practices.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1984, 1947. pp. 12.

[612]. 34.26 : 12.25 : 12.21. HEPTING, G. H. (to the United States of America). **Stimulation of production of oleoresins and gums in resinous trees.** *U.S. Patent* No. 2,436,359, Feb. 17, 1948. *Chem. Abstr.* 42 (8), 1948 (2786). P.R.

Stimulation of oleoresin flow in Pines by a fungus. *Science* 105 (2721), 1947 (209). D.S.I.R.

The injection of an isolated spore of *Fusarium* or pitch canker into the wound provides a prolonged flow of oleoresins from a single slash, thus eliminating repeated chipping, punching or slashing of the tree, and prolonging its life. Stumps of trees so injected also give a much higher yield when distilled.

[613]. 34.26 : 12.25. OSTROM, C. E., and SCHOPMEYER, C. S. **Increasing and prolonging the flow of oleoresin from trees.** *U.S. Patent* No. 2,435,724, Feb. 10, 1948. *Chem. Abstr.* 42 (8), 1948 (2786). P.R.

Salts and esters of 2,4-D and/or the free acid are applied to wounds in the bark of coniferous

trees to increase the yield of oleoresins and gums.

[614]. 34.26 : 12.25. MIMS, L. W., and SCHOPMEYER, M. C. **Properties of oleoresins, rosins and turpentines from chemically stimulated Slash and Longleaf Pine.** *Industr. Engng. Chem.* (*Industr. Ed.*) 39 (11), 1947 (1504–6). 13 refs. P.R.

The chemicals used to stimulate the flow of oleoresins were 25% NaOH, 24% HCl and 40 and 60% H_2SO_4. The results of the tests on oleoresins, turpentines and resins are tabulated. There was no significant effect on either oleoresins or turpentines with any of the chemicals; neither HCl nor NaOH treatment affected resin colour or transparency but 60% H_2SO_4 caused slight darkening of colour and both 40 and 60% some clouding in the resin.

[615]. 34.26 : 12.25 : 32.7 : 31.3. ANDERSON, A. B. **Chemistry of western Pines. Ponderosa Pine stumps as potential source of rosin and other by-products.** *Industr. Engng. Chem.* (*Industr. Ed.*) 39 (12), 1947 (1664–7). 10 refs. P.R.

Sample borings from Ponderosa Pine stumps were extracted with acetone and analysed; the results are tabulated and show that whole stumps that had seasoned in the ground for up to 5 years yielded about 17% or 340 lb. of extract (including resin acids, free fatty acids, esters, volatile terpenes, and unsaponifiable material) per ton of stumpwood. The more seasoned stumps thus approach the extractive yield of Southern Pine stumps and may prove a commercial source of rosin and other extractive by-products.

[616]. 34.26 : 12.25. HAAGEN-SMIT, A. J., REDEMANN, C. T., and MIROV, N. T. **Composition of gum turpentine of Torrey Pine.** *J. Amer. chem. Soc.* 69 (8), 1947 (2014–7). 3 refs. D.S.I.R.

[617]. 34.26 : 12.25. PATTON, E. L. **Modern techniques for processing Pine gum.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 4. 11 refs. P.R.

[618]. 34.26 : 12.25. MARRIOTT, F. G. (revised by GREAVES, C.). **Canada balsam, its preparation and uses.** *Mimeo. For. Prod. Lab., Can.* No. 123, 1947. pp. 5 + 2. 33 refs. P.R.

[619]. 34.26. NORDSTRÖM [NORDSHTREM], E. K. **Methods of treatment of wood resin to obtain substitute motor oil and fuels.** [Metodÿ pererabotki drevesnoy smolÿ dlya polucheniya zameniteley avtola i goryuchikh.] Foreign Journal Service, Coun. sci. industr. Res. Aust. [*n.d.*] pp. 4. *Transl.* from *Lesnaya Industriya* 1943 (7/8), (8). P.R.

[620]. 34.26 : 12.26–8. **Mastic.** *Bull. imp. Inst., Lond.* 45 (2), 1947 (133–4).

Account of the production of mastic resin from *Pistacia lentiscus* in Chios.

[621]. 34.26 (881). **[Gums and resins from British Guiana species.]** *Rep. imp. Inst., Lond.* 1947 (13–14).

Investigations have recently been carried out at the Imperial Institute on gums and resins from British Guiana. The most promising of these appears to be the material known as Barataballi latex, the botanical identity of which is somewhat uncertain, being given variously as *Calocarpum sapota*, *Ecclinusa guianensis* and *E. sanguinolenta*. The latex shows some promise as an ingredient of the base for chewing sweets. Locust gum (*Hymenaea courbaril*, *H. davisii*) is much inferior to the locust gum of commerce; incense gum (*Protium heptaphyllum*, *P. hostmannii*) is not a true incense gum but might be used as an ingredient in fumigants. No promising use has been discovered for Bastard Balata (*Manilkara huberi*) latex.

[622]. 34.26 (672) : 12.26–8. AUBRÉVILLE, A. Les copaliers et arbres à résine de l'Afrique équatoriale française. **[The gum- and resin-producing trees of French Equatorial Africa.]** *Agron. trop.* 3 (1/2), 1948 (18–24). [F.]

Notes on the species of *Copaifera* and *Daniella* producing copal gum, and other resin-producing species of Leguminosae, with their vernacular names. They are divided into 3 groups according to the distribution and presence or absence of resin canals.

[623]. 34.26 : 12.26–8 : 34.24 : 34.25. ANDREWS, S. M. **Kinos from the Australian Myrtaceae. Summary of information.** Information Service, Coun. sci. industr. Res. Aust. 1947. pp. 2. 8 refs. P.R.

The kino of *Eucalyptus calophylla* has considerable commercial possibilities. It is highly astringent, readily soluble in alcohol and does not form a precipitate on the addition of water.

It can be used to make a tincture for pharmaceutical purposes or as a source of tannin.

[624]. 34.26 : 12.26–8 (676). ***Melaleuca bracteata* oil from Kenya.** *Rep. imp. Inst., Lond.* 1947 (21).

Oil distilled from leaves and twigs of small trees, 3 ft. high, grown from seed from New South Wales, was of similar composition to the oil from the same species grown in Australia, though containing considerably more methyl-eugenol (82% content). The oil might be used as a source of methyleugenol for the preparation of eugenol derivatives.

[625]. 34.26 (54). KRISHNA, S., and BADHWAR, R. L. **Aromatic plants of India. Part I.** *J. sci. industr. Res., India* 6 (2), 1947 (Suppl. 1–24). D.S.I.R.

Brief descriptive notes on Indian aromatic plants including trees and shrubs of the families Magnoliaceae and Annonaceae.

[626]. 34.26 : 12.26–8 : 34.27. PISHAWIKAR, D. G., and SHAH, S. V. **A study of the oil from the seeds of *Swietenia mahagoni*.** *Journal of the University of Bombay* (*n.s.*) 15A (Pt. 3, No. 20), 1946 (17–20). L.S.

[627]. 34.26 : 12.26–8 : 34.27. POTTS, W. M., and BOLLEY, D. S. **Analysis of the fruit of the Chinese Tallow tree [*Stillingia sebifera*] in Texas.** *Oil and Soap* 23 (10), 1946 (316–8). 8 refs. L.S.

[628]. 34.26 : 12.26–8 : 34.27. POTTS, W. M. **The Stillingia tree as a source of drying oil.** *Paint, Oil and Chemical Review* 109 (25), 1946 (16, 18). L.S.

Seed oil from the Chinese Tallow tree [*Stillingia sebifera*] compared well with linseed oil in drying and weathering tests. [Cf. *For. Abstr.* 7 (No. 909).]

[629]. 34.26 (81). HORN, E. F. **Brazilian substitutes for gutta percha.** *Carib. For.* 9 (1), 1948 (45–51). [E.Span.f.]

[630]. 34.26 : 12.26–8. HATT, H. H., and HILLIS, W. E. **The manna of *Myoporum platycarpum* R. Br. as a possible commercial source of mannitol.** *J. Coun. sci. industr. Res. Aust.* 20 (2), 1947 (207–24). O.R.H.

Myoporum platycarpum, under conditions which have not yet been determined [cf. *For. Abstr.* 8 (No. 1627)], yields an exudate in which mannitol forms 60 to 80% of the total solids. This is not a unique phenomenon, similar exudates having occasionally been observed with other species, particularly Olive trees. The rates of production of exudate or manna were measured throughout the year for a few trees. The total solids of the exudate vary from 13 to 26%; the manna to which it dries usually contains about 90% of total solids, 70–80% of which is mannitol. In a year a single tree may produce 11 lb. of mannitol. Mannitol was present in the leaves (2·2%) and the bark (0·6%) of a healthy tree. A process for the larger-scale isolation of mannitol from this exudate is described. Gum-like materials make crystallization and filtration of mannitol difficult, but these may be removed without the use either of an organic solvent or of charcoal, and mannitol of reagent-grade quality may be obtained by one crystallization in yields of 50 to 60%. The method of Badreau for the determination of mannitol is described. Before any attempt is made to decide whether large-scale preparation of mannitol is economically possible, a method of inducing and maintaining exudation in the trees must be found. The annual yield of mannitol per tree is comparable with that of rubber and turpentine. *From authors' summary.*

[631]. 34.26 : 12.29. **Carnauba wax.** *Bull. imp. Inst., Lond.* 45 (2), 1947 (134–6).

Account of the production, yield, and preparation of carnauba wax from *Copernicia cerifera*.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

See also *For. Abstr.* 10 (Nos. 139, 144, 596, 602, 626–9).

[632]. 34.27 : 12.29 (86) : 12.19 : 21 : 34.25. ACOSTA-SOLIS, M. **Tagua or vegetable ivory—a forest product of Ecuador.** *Econ. Bot.* 2 (1), 1948 (46–57).

A study of the Tagua palm (*Phytelephas* spp.) and its distribution and utilization in Ecuador. It is mainly valued for the seeds, a source of vegetable ivory used for buttons, jewellery etc., and provides an easily exploited source of wealth for the natives. A well developed palm produces 15 or 16 fruits annually. In general a quintal (100 lb.) of seeds (with shells) is

obtained from 12 fruits, and yields approximately 60 lb. of shelled tagua. Harvesting is done all the year round; methods are primitive and often unnecessarily destructive. The palms, which do not coppice, are frequently felled and the unripe seeds (blond tagua), preferred for their greater softness, are gathered. In general, only natural stands are exploited, but some cultivation takes place in the Santiago river basin. Plantations are irregular, spacing varying from 2 to 5 or more metres, and are formed by direct sowing. The author believes that experimental cultivation and a study of pests would be of great advantage.

Some figures for Ecuadorian exports and U.S. imports of tagua between 1928 and 1944 are given. Between the wars the U.S.A. was the greatest importer, but now tagua has to compete with casein and bakelite products. Native uses of tagua are numerous—roots for medicine, the stem for flooring, the vegetative cone and the seeds for food, leaves for thatching, and the spathes for brooms and fibres.

[633]. 34.27 (678). RENSBURG, H. J. VAN. **Notes on some browse plants.** *E. Afr. agric. J.* 13 (3), 1948 (164–6).

Notes on browse plants (including trees and shrubs) which do well in semi-arid areas and might be expected to do well in Tanganyika, with results of such trials as have been conducted there. On the whole certain native species seem the most promising.

[634]. 34.27 : 12.26–8 : 21. LOOCK, E.E.M. **Three useful leguminous fodder trees.** *Fmg. S. Afr.* 22 (250), 1947 (7–12, 24). A.P.B.

Silvicultural characteristics, methods of propagation and nutritional values of pods of *Prosopis* spp., *Gleditsia triacanthos* and *Ceratonia siliqua*.

34.28. Bamboos

See *For. Abstr.* 10
(Nos. 70, 102, 366, 434, 455, 488, 770).

34.3. *Products of the Animal Kingdom*

[635]. 34.3 : 13.2 : 12.26–8. LOOCK, E. E. M. **Eucalyptus species suitable for the production of honey.** *J. S.Afr. For. Ass.* No. 16, 1948 (67–72 + 1 tbl.) 3 refs.

Cf. *For. Abstr.* 10 (No. 157).

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

See also *For. Abstr.* 10
(Nos. 19, 21, 24, 814, 821, 845).

[636]. 35 (4) : 98 : 09.4. **Economic Commission for Europe: Report of the Timber Sub-Committee to the 3rd session of the Economic Commission for Europe.** European Office of the United Nations, Geneva. Document E/ECE/57, 1948. pp. 18.

The Timber Sub-Committee of E.C.E. will deal primarily with questions of the production, distribution and consumption of sawn softwood and the production and export of pitprops, and secondarily with hardwoods, railway sleepers, plywood and fibre boards. The appendixes to this report show import and export of sawn softwoods (including sleepers, boxboards and timber equivalent of sawlogs), by countries, for the years 1937, 1946, 1947, and requirements for 1948.

[637]. 35 (469) : 98 : 34.24 : 34.26 : 09.4. La riqueza forestal y el comercio exterior portugués. **[The forest wealth and foreign trade of Portugal.]** *Montes, Madrid* 4 (19), 1948 (73–4). [Span.]

Contains figures for prices and quantities of Portuguese exports of cork, timber (Pine) and resinous products between 1938 and 1947.

[638]. 35 (595) : 32.8 : 12.26–8. NOAKES, D. S. P., and FLEMMICH, C. O. **The marketing of Malayan soft wood timbers.** *Malay. Forester* 11 (2), 1948 (64–8).

The 'soft' timbers of Malaya contribute about half the annual cut and this figure could be increased if export markets could be found, but the wide range of variation and large number of species involved make them difficult to market. The most numerous group is that known as Meranti, timber produced by many different species of *Shorea*. It has been decided to divide these timbers into 3 broad groups: Red Meranti, Nemesu or Dark Red Meranti, and Yellow Meranti. Later, if enough White Meranti is produced, it is intended to place it in a fourth group. The problem of marketing the other, very heterogeneous, soft woods is more difficult, because their occurrence is so sporadic. As a temporary measure it is proposed that importers should permit the inclusion of other *named*

timbers of a similar type and grade, in consignments of Meranti. This would increase the exportable output very considerably, and would have the advantage of enabling buyers to test these timbers on a small scale.

[639]. 35 : 98.1. RETTIE, J. C. **The purpose and basic concepts of timber consumption and requirements studies.** *J. For.* 46 (4), 1948 (237–42).

38. CONSTRUCTIONAL WORKS. ENGINEERING

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 10 (Nos. 250, 457, 568–70).

[640]. 38.2 : 82. SILVERSIDES, C. R. **Pulpwood logging camp construction.** *Pulp Paper Res. Inst. Can.* 1947. pp. 16. 21 refs.

[641]. 38.2. PROCUREUR, A. L'emploi du bois dans la construction des moulins à vent. **[The use of wood in the construction of windmills.]** *Rev. Bois Appl.* 3 (4), 1948 (3–7). [F.]

[642]. 38.2 : 31.27. EPSTEIN, H. **The use of composite timber-concrete construction for navy bases.** *Proc. Amer. Wood-Pres. Ass.* 42, 1946 (208–19).

A historical survey of the development of timber-concrete constructions with descriptions of various projects undertaken by the U.S. Bureau of Yards and Docks during the war. An account of strength tests carried out at the National Bureau of Standards on two types of composite slab is included.

[643]. 38.2 : 31.27 : 31.22. **A report on the structural soundness of unseasoned timbers used in structures erected for war purposes.** Department of Works and Housing, Melbourne. 1946. pp. 98 + 80 + 66 photos, 9 dgms., 18 tbls. P.R.

Reports on a survey of some 327 buildings, using green timber throughout, and considers their structural design. Examines in detail the few troublesome defects which have appeared and concludes that, if designs provide adequate allowance for drying out and shrinkage, and if regular maintenance can be arranged, satisfactory structures of considerable size can be erected using green timber as a major structural material. Includes sections on: the behaviour of timber; timber columns; nailed and bolted joints; split rings and shear plates; arch-type construction; maintenance; recommendations for the guidance of designers, supervisors and maintenance personnel; and, in an appendix, detailed analyses of nailed arch construction, allowable loads on columns, the influence of roof and wall sheeting in stiffening structures, and the effect of long-term loads on timber.

[644]. 38.2. DIETZ, A. G. H. **Details of design with timber connectors.** *Journal of the Boston Society of Civil Engineers* 32 (1), 1945 (1–17). L.S.

[645]. 38.2 : 33.36.1 : 31.42.11 : 13.2. **Decay and termite damage to houses.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1993, 1948. pp. 20. 14 photos.

Recommendations for building practices which will minimize the danger of fungus and termite damage to wooden members. [Cf. *For. Abstr.* 10 (Nos. 491–4).]

[646]. 38.2 : 31.45 (73) : 33.4. KEITH, L. P. **Influence of building codes on postwar wood construction.** *Prepr. U.S. For. Prod. Res. Soc.* 1947. pp. 5. 2 refs. P.R.

Discusses the threat to the use of timber in buildings embodied in some of the American building regulations relating to fire safety.

[647]. 38.2. NOYON. Notes sur la construction de charpentes à arbalétriers brisés de forme générale parabolique. **[Notes on the construction of roof trusses with compound main rafters of the general form of a parabola.]** *Bois For. Trop.* 5 (1), 1948 (55–60). [F.]

[648]. 38.2 : 31.27. GLOSS, R. H. **Full-size timber trusses tested under long-time loads.** *Engng. News-Rec.* 139 (12), 1947 (86–9). L.S.

Describes and expresses graphically the results of loading tests on 2 proprietary timber trusses over a 9-month period. In both cases the overload carried before failure was considerable, and it is suggested that the loads recommended for timber connectors, as corrected to the conditions of the tests, are unnecessarily conservative.

[649]. 38.2 : 38.3 : 33.4 : 33.15.5 : 33.32.3. STERN, E. G. **Modern timber construction in Europe. Part II.** *Bull. Va. polyt. Inst.* 41 (2), 1948. pp. 24. 16 refs. P.R.

Discusses and describes with illustrations and graphs of working strengths, European developments in : the 'Durisol' construction system with cement-bonded wood-fibre panels; saw-tooth timber splicing by means of high-frequency heat application; investigations on nailed timber joints; studies of timber-connector joint efficiency; wood beams and floors of composite constructions; nailed wood frame constructions; standard timber-girder bridge units; timber falsework; and wood subflooring for highway bridges.

[650]. 38.2 : 33.15.2 (494) : 38.3. WICHSER, O. Neuzeitliche Holzkonstruktionen bei den Schweizerischen Bundesbahnen. [**Modern timber structures on the Swiss railways.**] *Repr.* from *Schweizerische Bauzeitung* 127 (2), 1946. pp. 11. 3 refs. [G.] P.R.

Describes in detail new designs for the construction of platform roofs of plywood using nailing and gluing techniques, and of a timber road bridge. Compares costs with those of older constructional designs.

38.3. *Road and Bridge Construction*

See also *For. Abstr.* 10 (Nos. 649–50, 656, 803).

[651]. 38.3 : 33.4 : 31.27. HAUSKA, L. Holzersparnis bei Tragwerken aus einfachen und zusammengesetzten Balkenträgern. [**Timber economy in supporting structures consisting of simple and composite beam constructions.**] *Allg. Forst- u. Holz. Ztg.* 58 (3/4), 1947 (19–22). 1 ref. [G.]

Basing his calculations on a paper by A. Parenski (*Zeitschrift des Österr. Ingenieur- u. Architektenvereines*, 1923), the author examines the question of what savings in timber could be effected by reducing the cross-sectional dimensions of beams in structures where they are connected by transverse members, assuming that part of the load is taken over by the deformation of the latter, so that only the residual portion need be calculated as taken up by the longitudinal members. This problem is treated, purely mathematically, for a bridge construction, and it is concluded that under the specified conditions an over-all saving of 16% of the timber should be attainable, in addition to which 29% of the timber used would be transferred from the higher-grade, less readily available longitudinal to the lower-grade, commoner cross-members. The desirability is urged of tests to confirm or modify this conclusion.

[652]. 38.3 : 33.15.2. **Glued laminated stringers in Southern Pacific bridge.** *Wood Pres. News* 26 (3), 1948 (31, 39–40). P.R.

Describes the construction of a bridge containing caps and stringers built up of small laminated pieces, glued and subsequently pressure-creosoted. The bridge, which is in its 2nd year of service, will be studied for durability and performance under service conditions as against similar structures built of ordinary sawn timbers.

[653]. 38.3. KIRKPATRICK, R. E. **The Bailey bridge for woodlands use.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 961 (B–8–b), 1948. pp. 6.

The writer has tried to give enough details of the design of a Bailey bridge to enable any reader to determine the type of bridge and its approximate shipping weight, cost, etc. required for a given span and capacity.

[654]. 38.3 : 76. BAZIN, D. P. Dva voprosa transporta. [**Two transport problems.**] *Lesnaya Prom.* 1947 (9), (10–13). [Russ.]

Mathematical solutions (by formula and graphical methods) are given for problems connected with the economic spacing of skidding roads.

38.4. *Construction of Railways, Cableways, etc.*

[655]. 38.4 : 32.91.22. BENNETT, W. D. **Pole truck tracks.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 958 (B–8–b), 1948. pp. 2.

Details of construction of truck tracks, for use in the claybelt region of Ontario, of a simpler and cheaper type than the 'plank' truck track [see *For. Abstr.* 3 (240)]. The truck runs on a 5 × 5-in. rail instead of the old-type track of 15 in. or more in width. Ties 8 ft. long are first laid on tree-length stringers of a minimum top diameter of 4 ft. Rails are 16 ft. long, and rough Spruce, Jack Pine or Poplar may be used, the latter being more difficult to handle if not spiked down green, as it twists in

drying. An iron flange bolted to the inner side of each wheel keeps the truck on the track. Maintenance, when the track is in use about 7 months per year, rises from nil during the first two years to 50 man-days per mile during the fifth year. Since the old-type 'plank' track proved unserviceable without heavy maintenance after 5 years, it is considered that the new type will be just as effective. Approximate labour and material requirements per mile are given.

38.8. *Torrent Training*

See also *For. Abstr.* 10 (No. 52).

[656]. 38.8 (782) : 38.3. STACEY, W. A. **Bank stabilization in Nebraska.** *Wood Pres. News* 26 (2), 1948 (18–20, 25–6). P.R.

Describes, with photographs, 2 widely used methods of achieving bank stabilization at the principal river bridges on State highways. Both methods use creosoted wood piles and cut trees.

4. FOREST INJURIES AND PROTECTION

[657]. 4 (410). **Protection.** *Tech. Notes For. Comm., Lond.* Sect. IVA, 1947. pp. 11. *Suppl.* to *Tech. Notes For. Comm., Lond.* Sect. IV, 1946.

Cf. *For. Abstr.* 8 (No. 2071).

41. GENERAL PROTECTION AGAINST FOREST INJURIES

[658]. 41 : 07.7. McLane, F. C. **The use of aircraft in forest protection.** *J. For.* 46 (5), 1948 (331–3).

[659]. 41 : 44.3 : 45.3. Fletcher, F. W., and Kenaga, E. E. (to the Dow Chemical Company). **Parasitical compositions.** *U.S. Patent* No. 2,410,281, Oct. 29, 1946. pp. 3. *Prev. Deterior. Abstr.* 3 (2), 1947 (F40). D.S.I.R.

Application of chloromononitrophenols in either spray or dust form will protect dormant trees from such organisms as San José scale, scurfy scale, oyster-shell scale, scab, spores and mycelia of various overwintering fungi and the eggs of insect and mite pests, aphids, red spiders, bud moths, etc. Suggested diluents for spray application include petroleum distillates, vegetable, animal and fish oils, and high-boiling synthetic materials. Some suitable solid carriers listed are volcanic ash, diatomaceous earth, talc, kieselguhr, wood flour, gypsum and bentonite.

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

See also *For. Abstr.* 10 (Nos. 153, 696, 712).

[660]. 42 : 12.25 (949). Pryor, L. D. **Damage to *Pinus radiata* by climatic agents.** *Aust. For.* 11, 1947 (57–64).

From observations made, principally in the Australian Capital Territory, damage to *Pinus radiata* (Monterey Pine) caused by various climatic agents is described. Low temperatures are considered to be responsible for needle discolouration in winter and dead tips and needles in certain cases in young trees, small frost cracks, frost rings and strangulation. Strangulation appears to be a peculiar extension of the same type of damage as that which results in frost rings. It often causes death of the bark and cambium in a girdle near the base of the trunk and is followed by symptoms of ringbarking and in many cases by the death of the tree. High temperatures are thought to cause sunscorch resulting at times in extensive lesions, while drought appears to be responsible for excessive casting of needles, and some dying in leading shoots. Hail and snow cause only minor damage in the areas in which Monterey Pine has been planted in the Australian Capital Territory, but there is evidence to show that the species is not strongly resistant to snow. *Author's summary.*

42.1. *Air Currents*

See also *For. Abstr.* 10 (Nos. 160, 744–5).

[661]. 42.1 : 12.25 (744) : 13.2 : 42.5. [Jones, B.] **Hurricane damage to Pine and scale insects.** *J. For.* 46 (4), 1948 (262).

In a 100-m.p.h. gale salt spray covered almost everything on Nantucket Island. Many trees of *Pinus thunbergii* were broken and uprooted, but the needles of the survivors remained green though drenched with salt spray. *P. tabulaeformis, P. strobus, P. sylvestris* and *P. resinosa* were severely damaged by salt spray. Pine needle scale [*Chionaspis pinifoliae*] on *P. mugo* completely disappeared during the hurricane, whether by mechanical action or by the toxic effect of the spray is not known. *P. mugo* itself was unaffected.

42.2. *Temperature Influences*

See also *For. Abstr.* 10 (Nos. 76, 769).

[662]. 42.21 : 12.25 : 24.51 : 46 : 44.3. [Day, W. R.] **The occurrence of cankers on the butt length of main stems of conifers, in plantations in the pole stage, after pruning or brashing of side branches.** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (10–11).

Examples of cankering in Corsican Pine, Norway Spruce and Japanese Larch are adduced. Examination of the material gave clear indications that this was caused by a non-parasitic factor, almost certainly frost. Unbrashed trees in the same stands were unaffected and the possibility is suggested that the pruning

of live branches stimulated the cambium to maintain a longer growing season than normal. Further material is being investigated in order to determine the consistency with regard to type and date of occurrence of the injuries in the various seasonal pruning experiments. So far, there has been no indication that parasites play any important part in connexion with this phenomenon, but there is no doubt that heart rot in the butt length will usually develop as a result of it.

[663]. 42.21 : 12.25. [DAY, W. R.] **[Die-back of Japanese Larch in the pole stage.]** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (11–12).

A case of die-back of Japanese Larch was investigated at Fontmell in Dorset. The affected plantation is on a chalky soil and grew well until the last few years. The die-back affects the top of the crown and seems to be caused by frost injury and probably in part, at least, by autumn frost. The trees are in the pole stage and grow in a valley in which severe frosts are to be expected. The occurrence of severe injury only when a dense pole state has been reached, agrees with the development of frost die-back in European Larch and Corsican Pine, which also tends to be most severe after a closed canopy has been formed. This phenomenon seems to be related to the restriction of air circulation within the plantation and is one of the matters which need investigating meteorologically.

[664]. 42.21 : 12.26–8 : 44.3. [DAY, W. R.] **[Frost injury and bacterial canker of Poplar.]** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (12).

Material was examined from Lombardy Poplars in Devon which were suffering severely from die-back. Frost injury followed by bacterial infection appeared to be the principal cause of the disease, and it appears that susceptibility to frost injury is one of the factors which has to be taken into account when investigating the causes of differences in immunity to bacterial canker of different Poplar strains.

[665]. 42.22 : 23.26 (411–4). PETRIE, S. M., and MACKAY, A. **Seed-beds and the heat wave.** *Scot. For.* 1 (3 4), 1948 (30–1).

Seed sown in Argyll in the last week of May, 1946, made normal growth until the beginning of August. About mid-August it was noted that seedlings were turning brown and then breaking off at the soil surface. There was no sign of insect or fungus damage, and spraying against damping-off disease had no effect. Microscopic examination revealed a rupture of the exterior tissues of all the seedlings, leaving in most cases a slight strand as the only organic connexion between the stem and the root, and it was concluded that the damage was due to heat, the crystalline particles of grit covering the beds having been raised to a very high temperature and scorched the seedling stems. The severity of damage to species was in the following order:—Japanese Larch, Sitka Spruce, Scots Pine, Norway Spruce, Douglas Fir. Douglas Fir, the most shade-bearing of all, was least affected; practically no damage was noticed in these beds.

42.5. *Chemical Influences. Nutrient Deficiencies*

See also *For. Abstr.* 10 (No. 661).

[666]. 42.5 : 12.11.12 : 12.11.11. HEWITT, E. J. **Relation of manganese and some other metals to the iron status of plants.** *Nature, Lond.* 161 (4091), 1948 (489–90). 23 refs.

[667]. 42.5 : 41. LEVY, B. F. G. **Tree injection I. The estimation of dosage in relation to tree size. II. Methods for overcoming resistance to absorption of liquids. III. Re-invigoration of debilitated trees.** *Rep. E. Malling Res. Sta. 1946*, 1947 (99–112 + 4 photos). 9 refs.

(I) Previous methods for estimation of dosage and the need for a reliable method are discussed. Tree size, as measured by the cross-sectional area of the stem, is compared with dosage on four sets of trees. From these it is concluded that the maximum safe dose was approximately 0·5 g. of salt per sq. cm. of cross-sectional area, and that this could be used as a basis for the estimation of dosage in the field. A trial of this method, on a further set of 132 trees, supported this conclusion. Recommendations are given for the practical application of the method.

(II) It is pointed out that trees will sometimes not absorb liquid when injection is attempted. Three methods of overcoming this are described:—raising the reservoir to give a head of pressure, using a force pump, using the pump

followed by injection in the normal way. A method of measuring rate of absorption during injection is described.

(III) Apple trees severely affected by potassium deficiency were injected in midsummer with a 'complete' nutrient rich in potassium. In the same summer, incipient fruit buds were stimulated into vegetative growth. Next spring, on the treated trees, there were decreases in the proportion of fruit to wood buds, in die-back, in 'ghost-blossoms', and later in leaf scorch. The experiment does not allow of any final conclusions, but it does show that benefit can be derived from injections in midsummer despite growth having practically ceased. The amount of deterioration was reduced, but neither the cropping nor the extension growth was materially increased in the year of injection or the next. However, the injected trees seemed likely to produce better growth and crops the next year, since they possessed more bearing wood and healthier foliage.

42.6. *Electrical and Cosmic Influences*

[668]. 42.61 (73). THOMPSON, A. R. **Final report of the lightning struck tree survey conducted by the National Shade Tree Conference 1936–1946.** *Proc. 22nd nat. Shade Tree Conf.* 1946 (196–210).

For earlier report see *For. Abstr.* 7 (No. 395). The data obtained during the 10 years' survey are summarized in a series of tables. There is no evidence that some species are more or less likely to be struck than others. Lightning-struck trees may apparently suffer only superficially and yet not recover, so repair and rehabilitation work on ornamental trees should not be carried out until the full extent of the damage has been determined.

43. FOREST FIRES

[669]. 43 (431–5). RYLE, G. B. **Forest fire protection in Germany. An examination in Regierungs Bezirk Lüneberg (914 Military Government).** *Forestry* 21 (2), 1947 (141–5).

Landkreis Soltau, a typical area of the Lüneberg forest, was briefly inspected in order to study fire-protection practices. The forests are well split up by cultivated rides, which are tractor-ploughed annually. Railway fire-breaks are formed by a strip 6 m. or less, immediately adjacent to the permanent way, which is scythed periodically, then a strip 2 m. wide, hand cultivated down to the soil, and another identical strip about 10 m. farther back. The two clean lines are joined by cross cultivations every 50 m., the rectangles so formed being planted with Pine on short rotation. The Landkreis is divided into 3 danger zones, each under a Forstmeister, who controls 10 Revierförster. Normally the Revierförster has full control over the fire-fighting organization—fire-brigades, police and civil population. This displays some shortcomings, due partly to the aftermath of war and partly to inertia on the part of the Forest Service. The compressed-gas knapsack spray, using a solution of $CaCl_2$ and sodium acetate (60 kg. $CaCl_2$, 10 kg. sodium acetate per 1,000 litres water) is considered of great value.

[670]. 43 (431–5). WECK. **Neue Unterlagen für eine Waldbrandbekämpfung. 1. Auswertung der Statistik. [New basis for a campaign against forest fires. 1. Evaluation of the statistics.]** *Mitt. Reichsinst. Forst- u. Holzw., Hamburg* No. 1, 1947. pp. 20. [G.e.f.span.]

Analyses statistics of forest fires in different districts of Germany, Austria, Hungary, U.S.S.R. and U.S.A. over a period of years, and discusses factors affecting the outbreak and spread of fires, types of stand most affected, types most suitable for use as fire-breaks and the average rate of fire spread. Divides Germany into 3 zones as regards large-scale fire danger.

43.0 *Predisposing Factors and Causes*

[671]. 43.01 (944). LUKE, R. H. **Some notes on fire occurrence related to weather in the Taree-Newcastle district.** *N.S.W. For. Rec.* 1 (1), 1948 (27–9).

The conclusions derived from this study are that the fire season lasts from November 1 till the end of February but that periods of acute fire danger vary widely within those limits; conditions conducive to occurrence and rapid spread of fire are north-westerly and westerly winds, temperatures above 90° and periods of deficient rainfall.

[672]. 43.01 : 31.22. BRYAN, J. **The effect of atmospheric humidity on the development of fires.** *Forestry* 21 (2), 1947 (148–50). 1 ref. [Department of Scientific and Industrial Research, Forest Products Laboratory, Princes Risborough.]

Tests were made to determine the effect of atmospheric humidity on the burning of wood, apart from its effect on moisture content. Samples of *Thuja plicata*, *Pseudotsuga taxifolia* and *Pinus sylvestris* were conditioned to a constant weight at relative humidities of 30, 60 and 90% at 25° C. and were then subjected to a strip-burning test at relative humidities of 25, 60 and 90%, still at a constant temperature of 25° C. The results indicate that the humidity of the surrounding air does have some influence on the burning of wood, irrespective of its effect on the moisture content, particularly where the continuity of burning is in the balance. In these tests the effect was most marked in the samples conditioned at 60% relative humidity, but this is due to the particular size of the test specimen. With thicker samples the effect would probably be most pronounced on those conditioned at 30%. Graphs from recordings of atmospheric humidity at Princes Risborough superimposed on a chart showing the hourly incidence of 619 fires in the New Forest reveal a fairly general correlation.

43.1. *Protective Measures*

See also *For. Abstr.* 10 (Nos. 190, 236).

[673]. 43.1 (73). WOOLLEY, R. B. **Ravaging forest fires emphasize need of improved fire control.** *Fire Engng.* 100 (11), 1947 (788–93, 808–12). D.S.I.R.

Surveys the damage and extent of forest fires in the eastern U.S.A. during October, 1947, discusses the use of radio communications, and of planes and helicopters, and appraises the value and limitations of wetting agents and water fog as shown during fire-fighting operations.

[674]. 43.1 : 07.7. [FLYNN, T.] [**Fire fighting and fire prevention:**] **The 1948 equipment.** *W. Cst. Lumberm.* 75 (3), 1948 (61–5).

Descriptions of the Trail Beetle tractor; 'Disc Dozer' plough; a trailer plough; a new rotor trencher; a light-weight, electrically driven limbing saw, which can also be used as a brush cutter for trail maintenance—the motor, cutting bar and chain weigh only 9 lb.; and new, light-weight, 'slip-on' tank pumps.

[675]. 43.11 : 07.7 (762). **Mississippi develops fire lane burners.** *Sth. Lumberm.* 176 (2205), 1948 (50, 52).

The Mississippi State Forest Service has instituted a roadside burning system, making use of 6 specially built machines consisting of 10 butane torches in a movable oven suspended from the rear of a truck. A fuel tank and a water tank are mounted on the chassis together with an air compressor, control valves, and a 100-ft. reel of water hose which trails behind the unit. The burners develop a flame of intense heat sufficient to destroy the vegetation as the oven passes over it; a drag attached to the rear of the burners and a sprinkling system, extinguish the smouldering ashes, and an attendant walks behind with a rake and the trailing hose to make sure that the flames are completely extinguished. Under best conditions, 2 miles of 8-ft. firelane per hour can be constructed.

[676]. 43.11 : 12.25 : 56 : 12.19.23 : 07.2. DENT, T. V., and DABRAL, S. N. **Controlled burning in a Chir plantation.** *Indian For. Bull.* (*Silviculture*) No. 131, 1942 (1947). pp. iii + 35 + 4 photos, 3 gphs. 14 refs.

Summarizes the results of a 5-year experiment—a 'sighting test'—conducted at the Forest Research Institute, Dehra Dun, into the effects of controlled burning on the development of a young plantation of *Pinus longifolia*. The two aspects of the question particularly studied were the effects (*a*) on the Pine crop and (*b*) on the associated vegetation. The indications were that annual controlled burning in 10- to 15-year-old *Pinus longifolia* may result in a slight falling off in the rate of height and diameter increment; this may amount to as much as 10% but under slightly different site conditions may be insignificant. In no case did burning radically affect the total frequency of occurrence of an understorey species, but there was a marked tendency towards a smaller proportion of plants over 10 ft. high in burnt plots than in unburnt. The effect of burning on the ground flora is analysed and suggestions are made for the design and execution of future investigations of this sort.

[677]. 43.11 (676). MASEFIELD, G. B. **Grass burning: some Uganda experience.** *E. Afr. agric. J.* 13 (3), 1948 (135–8).

A summary of experience in methods of controlled burning in Uganda, including fire-breaks and other protective measures.

[678]. 43.12 : 07.7 : 82. BYRAM, G. M., and JEMISON, G. M. **Some principles of visibility and their application to forest fire detection.** *Tech. Bull. U.S. Dep. Agric.* No. 954, 1948. pp. 61. 31 refs. [Stheast. For. Exp. Sta., Asheville, N.C.]

The studies discussed here had as their primary object the development of ways of determining visual range, which is shown to depend on a complex of visual, physical, and meteorological factors, the effect of which is discussed. The most practical method of determining atmospheric attenuation is with balance-type telephotometers, two of which are described in detail, namely the Byram haze-meter for use in mountainous country and the Plains haze-meter for use in flat or rolling country. Other types of visibility meters and visibility scales (e.g. haze silhouettes), for use when instruments are not available, are discussed. The basic principles of visibility were used in the development of an eyesight test for look-out observers, by which ability to see small smokes can be rated. By selecting keen-sighted men, the visual range can be increased by 2–3 miles or 30% under normal haze conditions. The test and its application are described in detail. A haze-penetrating filter which increases visibility distance by about 20% under some conditions is described. Its use is limited to clear days and to directions at right angles to the sun. A discussion of periscopes, telescopes, and binoculars shows binoculars to be the only instruments of material aid in smoke detection; they should have a magnification of 3–4 diameters and an apparent field of at least 45°. Coloured filters are thought to have little or no value in increasing visual range. Notes are given on structural features of look-out houses that will eliminate eyestrain. *From authors' summary.*

[679]. 43.12 : 42.61. MORRIS, W. G. **What is the time between ignition and discovery of lightning fires?** *For. Res. Notes Pacif. Nthwest. For. Exp. Sta.* No. 40, 1947. pp. 5.

A study of fire reports for Washington and Oregon shows that 46% of such fires are discovered in the first hour in Washington forests but only 22% in Oregon. This difference is largely due to different cover types. About 50% of the fires are seen within 6 hours, 80% within 24 hours, and 90% within 3 days. From this it appears that emergency lookouts, patrols etc., may be needed for at least 3 days after a severe storm.

[680]. 43.13 : 07.7. KERN, J. C. **Flying fire engines.** *Amer. Forests* 54 (5), 1948 (208–9, 238, 240).

Describes the successful and economical use of helicopters for patrolling and transporting personnel in fire-fighting operations in the Angeles National Forest, Southern California.

[681]. 43.13 : 07.7. **Combating forest fires.** *Timb. Tr. J.* 185 (3741), 1948 (947–8).

Radio-controlled converted Bren-gun carriers were used successfully in a fire-fighting experiment in Surrey. The carriers are converted to carry a portable fire pump and 2 water tanks, each holding 180 gal. of water. The crew consists of a driver, a radio operator, who is in constant two-way communication with the control point and one man to manipulate the hose.

43.3. *Fire Damage*

[682]. 43.3 : 12.25 : 31.42. FIELDING, J. M. **Observations on fire-killed Monterey Pines [*Pinus radiata*].** *Aust. For.* 11, 1947 (15–19).

At Mt. Burr, in South Australia, a study was made of standing fire-killed 27-year-old Monterey Pine plantation trees for a period of 21 months following the fire. Severe fungal attack was associated with a reduction of moisture content below approximately 70%. The trees behaved with marked individuality, differences being due mainly to differences in the degree of fire damage. The less the damage the greater the amount of cambium that may remain alive, the greater the tendency of the moisture content of the tree to remain high and the less the fungal attack. The timber in the top section of the tree deteriorated much more rapidly than that towards the base. This difference in durability was associated with a difference in rate of drying. During the first six months the only deterioration noted was confined to slight blue staining in the top section of the tree. Deterioration in the basal

20 ft. was first noted in a tree felled 9½ months after the fire. All the timber sawn from trees felled during the first 14 months was saleable. Trees felled subsequently contained an increasing amount of unsaleable timber, but even the last trees to be felled (21 months after the fire) contained some timber which was perfectly sound. *Author's summary.*

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

See also *For. Abstr.* 10 (No. 216).

[683]. 44.1 : 12.25 (44). BERGOGNE, L. Le débroussaillement des forêts landaises. [**Clearance of undergrowth in the forests of the Landes.**] *Rev. Eaux For.* 87 (2), 1948 (89–100). [F.]

The forests of Maritime Pine in the landes of Gascony are infested with a dense understorey of heath (*Erica scoparia*), gorse (*Ulex europaeus*) and *Molinia coerulea*, which constitute a serious fire hazard and make movement in the forest difficult. The various methods of control are considered: (1) mechanical, (2) biological, (3) chemical. The long-term policy recommended is the establishment of broadleaved species (e.g. *Quercus borealis*) as an understorey to counteract the excessive illumination under the open stands of *P. pinaster*.

[684]. 44.1 : 12.26–8. MARTIN, S. C. **Controlling Mesquite with diesel oil.** *Res. Note Sthwest. For. Exp. Sta.* No. 115, 1947. pp. 4.

Efforts to find a killing agent for Mesquite [*Prosopis juliflora*] as effective as sodium arsenite, but safer to use, led to experiments with kerosene and diesel oil [cf. *For. Abstr.* 8 (No. 1770)]. The method described in this paper has been tested on the Santa Rita Experimental Range and was effective for the tree form of Mesquite. The diesel oil may be sprayed or poured on the trunk or stump at ground level. In spraying, best results are obtained by spraying against and round the base of the tree and letting the oil run down the bark into the soil; application should be made not more than 6 in. above the ground. To get the best results from pouring, a basin should be dug round the stump to retain the oil and ensure complete circling of the tree. The essential thing is that the soil should be soaked all round the tree, down to the top of the tap root. The most recent cost figure for killing Mesquite with diesel oil is 4.1 cents per tree, divided equally between labour at 79 cents per hour and diesel at 10 cents per gal.

[685]. 44.1 : 12.26–8 : 60.1 : 23.23.19 : 12.19 : 21.2. [**Mesquite control.**] *Rep. Sthwest. For. Range Exp. Sta.* 1947 (8–13).

Spraying tests indicate that the leaves and small twigs of large dune-type Mesquite can be killed either with diesel oil or with high concentrations of 2,4–D, but sprouting almost always follows. Injection of diesel oil directly into dunes resulted in partial killing of the plants so treated. Injection of carbon disulphide was even more effective. These results suggest that the underground portion of large dune Mesquite may be more vulnerable than the aerial parts.

Studies have been made of some ecological aspects of Mesquite control. Germination tests were made recently on 5 seeds of *Prosopis velutina* from a herbarium specimen collected in 1903; one germinated normally when moistened and two others did so when scarified. It therefore appears that, at least in the dry atmosphere of a herbarium, Mesquite seed-coats can retain their impermeability and embryos their viability for 44 years or more. The practical implication is that Mesquite seedlings may be expected on cleared land for many years after eradication of the original stand. Further tests showed that at least 12% of sound seed are encased in highly impermeable seed coats and will probably lie undamaged in the soil for many years.

A study to determine the effect of Mesquite control on soil moisture content indicated that significantly higher moisture percentages occurred where Mesquite had been eliminated than on untreated areas. The difference was greatest in the 0–6 in. and 6–12 in. layers of soil, where perennial grasses obtain most of their moisture. The effect of Mesquite competition decreased with increasing distance from the tree, until it was of little consequence 30 ft. from the stem. During the summer of 1946 the soil moisture content on the Mesquite control tracts was greater in the surface 12 in. of soil by 42·6%, 30·0% and 6·0% at 10, 20 and 30 ft. respectively from Mesquite stems. On

these same areas, Mesquite control resulted in 87·7% more perennial and 159·7 more annual grass production. Reports are also given on studies of the effect of Mesquite control on range reseeding, and grass distribution (1) in Mesquite stands, (2) in thinned Mesquite stands.

[686]. 44.1 : 12.26–8 : 41. MINSHALL, W. H. **Eradication of poison ivy (*Rhus radicans* L.). II. Preliminary results with 2,4-dichlorophenoxyacetic acid. III. Further preliminary results with 2,4-dichlorophenoxyacetic acid formulations, ammonium sulfamate, and sodium chlorate.** *Sci. Agric.* 26 (12), 1946 (662); 28 (3), 1948 (140–1). O.R.E.

[687]. 44.1 : 12.29 : 41. PAT, Y. **Experiments with dichloro-phenoxyacetic acid as a herbicide.** *Repr.* from *Palest. J. Bot.* (*R.Ser.*) 6 (1), 1947 (55–7). 5 refs.

Sprayings with 2,4-D in a concentration of 0·5% and more, have proved very poisonous to young plants, while weaker solutions are not effective enough for the extermination of monocotyledonous perennial weeds causing damage to *Citrus* groves in Palestine. The poison is absorbed by the roots of *Citrus* seedlings whether applied near the root crown or in percolating irrigation water, and in either case causes serious damage. *From author's summary.*

[688]. 44.1 : 41 : 42.5 : 12.26–8. PIRONE, P. P. **2,4-D injury to trees**—With discussion. *Proc. 22nd nat. Shade Tree Conf.* 1946 (107–19). 4 refs.

Tests were made of the susceptibility of Norway Maple [*Acer platanoides*] and Pin Oak [*Quercus palustris*] to injury from 2,4-D spray. It was found that leaf distortion was produced by spraying dormant buds with dilutions recommended for lawn treatment. The addition of a pint of 2,4-D mixture at double the recommended strength to the soil around each tree caused slight distortion of the buds that emerged subsequently. Striking distortion of many species of trees, shrubs and other plants occurs in the neighbourhood of factories manufacturing 2,4-D; injury varies from slight twisting of leaves and petioles to complete killing of small plants and shrubs.

[689]. 44.1 : 23.26 : 41. STOECKELER, J. H. **Killing nursery weeds with oil sprays.** *Tech. Notes Lake St. For. Exp. Sta.* No. 290, 1948. p. 1.

Oil sprays applied several times during the growing season give promise of reducing weeding costs in coniferous forest nurseries by as much as 70–80%. Tests were made in the summer of 1947 on Red Pine and White Spruce seedling and transplant beds at a nursery at Rhinelander, Wisconsin. Of the five products tested, Stoddard solvent and Sovasol No. 5 (oils used by dry-cleaners) gave 91·2 and 90·8 kills respectively with little or no injury to coniferous trees; No. 1 burner oil (an ordinary oil burned in furnaces and stoves) was not very effective; Weedone and Esteron 44 (2,4-D products) caused injury to the trees. The sprays were applied full strength as a fine mist with a high-pressure garden sprayer, using as little as 70–80 gal./acre at about 70 cents per gal. Treatment was most effective on weeds less than 3 in. in height or spread. The sprays severely injured or killed hardwood seedlings. Reports indicate that the oils most effective in weed control invariably have about 15% by volume of aromatic hydrocarbon. Oil sprays have been used successfully on other crops, notably in controlling weeds in fields of carrots and parsnips and in guayule nurseries. No ill effects to the soil have been observed even after use for a number of years; the oils are apparently quite volatile and evaporate shortly after application.

[690]. 44.1 : 12.29 : 12.11.15 : 12.19. OSVALD, H. Växternas vapen i kampen on utrymmet. **[The equipment of plants in the struggle for space.]** *Repr.* from *Växtodling, Uppsala* 2, 1947 (288–303 + 4 photos). 13 refs. [Sw.sw.e.] [Institutionen for Växtodlingslära vid Kungl. Lantbrukshögskolan, Uppsala.]

It was observed on the experimental field of the Agricultural College of Sweden that rape germinated and developed poorly on certain patches where couch grass (*Agropyron repens*) was abundant. Preliminary experiments were therefore made to discover any possible effects of extracts from couch-grass roots and stolons on the germination of rape and oats. It was found that aqueous extracts contained a substance which, in sufficiently high concentration, inhibited germination. Very low concentrations of the toxic substance, on the other hand,

promoted germination, while intermediate concentrations had a retarding effect on germination and on root and shoot development. The concentration required for complete inhibition of germination in oats was more than twice that required in the case of rape. At moderate to rather high concentrations the active substance favoured development of moulds such as *Mucor* and *Penicillium*. These grew well at concentrations which were clearly injurious to oats, though at still higher concentrations their growth also was retarded. Seeds prevented by the toxin from germinating were for the most part not killed by it, but succumbed to moulds.

The effects obtained are similar to those of growth substances, and the toxin may well be a growth substance. It will pass in solution through a cellophane dialysis membrane, and appears to be a weak acid, readily soluble in water or alcohol.

These preliminary results suggest that the competitive ability of couch grass, and presumably of other grasses also, is due in part to the effects of root exudates. It is further suggested that the resistance or susceptibility of certain species to hormone derivatives may be correlated with their own level of production of similar growth substances. Such a hypothesis would explain many phenomena in crop production and the natural grouping of vegetation, and particularly the detrimental effect of grasses on other species. [Cf. *For. Abstr.* 10 (No. 154).]

44.2. *Parasitic Higher Plants*

[691]. 44.2 : 12.26–8 : 12.14. MANGENOT, G. Recherches sur l'organisation d'une Balanophoracée: *Thonningia coccinea* Vahl. [**Research on the structure of a member of the Balanophoraceae: *Thonningia coccinea* Vahl [root parasite of tropical forests].**] *Rev. gén. Bot.* 54 (641; 642), 1947 (201–44; 271–94). 13 refs. [F.] O.B.D.

44.3. *Fungi*

See also *For. Abstr.* 10 (Nos. 69, 78, 109, 111, 132, 140, 142, 197, 202, 244, 659, 662–4, 766).

[692]. 44.3 : 41. CARTER, J. C. **Organic fungicides** (With discussion). *Proc. 23rd nat. Shade Tree Conf.* 1947 (122–30). 6 refs.

Of the 22 organic fungicides tested on shade trees in Illinois, Puratized Agricultural Spray (phenyl mercury triethanol lactate) 1 : 5,000 was the most effective in controlling anthracnose of Sycamore and leafspot of Black Walnut. About 3% of leaves of treated, and 60% of leaves of untreated Sycamores were affected with anthracnose. Black Walnut had 1–20 spots per leaflet on sprayed, and 0–200 spots per leaflet on unsprayed trees. *From author's summary.*

[693]. 44.3 : 12.21 : 12.11.15. **Antibiotics.** *Rep. Ariz. agric. Exp. Sta. 1946*, 1947 (59–60).

Budwood of a hybrid of Japanese Plum was freed of *Phytomonas pruni* by treatment in partial vacuum with streptomycin. Both crude and commercial streptomycin were satisfactory agents. Stem galls on *Bryophyllum* and other plants were cured by applications of penicillin and streptomycin. Bacterial ring rot of seed potatoes, caused by *Corynebacterium sepedonicum* can probably be controlled by using penicillin on seed pieces.

[694]. 44.3 : 23.27 (73) : 44.4. MARSHALL, R. P., and WATERMAN, A. M. **Common diseases of important shade trees.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1987, 1948. pp. 53.

[695]. 44.3 : 12.25–8 : 12.21 (764 : 766) : 24.4 : 23.21. WRIGHT, E., and WELLS, H. R. **Tests on the adaptability of trees and shrubs to shelterbelt planting on certain *Phymatotrichum* root rot infested soils of Oklahoma and Texas.** *J. For.* 46 (4), 1948 (256–62). 6 refs.

Six years of study on a number of soil types showed that only a few of the tree and shrub species used were markedly resistant to root rot and none were immune. Most resistant were *Celtis occidentalis, Sapindus drummondii, Chilopsis linearis, Juniperus virginiana,* and *J. scopulorum; Ailanthus altissima* was somewhat less resistant. The following species were highly susceptible and should not be planted on infected soils:—*Ulmus americana, U. pumila, Gleditsia triacanthos, Gymnocladus dioicus, Maclura pomifera, Elaeagnus angustifolia,* and *Populus sargentii.*

Shelterbelts on freely permeable sandy soils lost much less to root rot than similar nearby plantations on less permeable soils. Indications were that use of a chequer board or alternate arrangement of planting, rather than rows all of

one species, might still further reduce losses from root rot even for resistant species. *From authors' summary.*

[696]. 44.3 : 12.25 : 12.21 : 42. DAY, W. R. **The penetration of conifer roots by *Fomes annosus*.** *Quart. J. For.* 42 (2), 1948 (99–101). 3 refs.

Examples are quoted of *Fomes annosus* occurring in root-bark of Scots Pine, Douglas Fir and Japanese Larch, where no injury had previously taken place, but where, in some cases, the bark had begun to die back. There is evidence to suppose that sometimes other factors e.g. adverse physical conditions, cause the root-bark to die before infection with *F. annosus* and infection may depend on a condition of debility produced by these other and more fundamental factors. This would explain why it is difficult to obtain artificial infections with *F. annosus* and why, on larger trees, only a part of the root system usually succumbs to infection. [Cf. *For. Abstr.* 8 (No. 1373).]

[697]. 44.3 : 12.25 : 12.26–8 : 12.21 : 41. STRONG, F. C. **Red Cedar-Apple and Hawthorn rust disease control by spraying Red Cedars in the spring.** *Quart. Bull. Mich. agric. Exp. Sta.* 30 (3), 1948 (283–8). 3 refs.

The use of Bordeaux 180 as a spray to control *Gymnosporangium juniperi-virginianae* and *G. globosum* on Red Cedar [*Juniperus virginiana*] and its alternate hosts (species of Hawthorn and Apple) was very successful and caused no injury to foliage.

[698]. 44.3 : 12.21. MARSDEN, D. H. **A *Valsa* associated with *Cytospora* canker of Spruces.** *Phytopathology* 38 (4), 1948 (307–8). [Massachusetts Agricultural Experiment Station, Amherst, Mass.]

Description of a species of *Valsa* found associated with cankers of Spruce and thought to be *V. kunzei*. Although no positive relationship was established, similarity in growth characteristics on nutrient media and sterilized twigs indicated that *V. kunzei* may be the perfect stage of *Cytospora kunzei*, thought to be the causal fungus of Spruce canker disease. A limited number of experiments showed that cankers and death of Norway Spruce branches may follow inoculation with mycelium from single-spore cultures of the *Valsa*.

[699]. 44.3 : 12.25 : 12.21 (481) : 12.26–8. ROLLHANSEN, F. Nytt om lokkrusten (*Pucciniastrum padi*). [**New information on *Pucciniastrum padi*.**] *Medd. norske Skogforsøksv.* 9 (4), (No. 34), 1947 (504–10). 2 refs. [Nor.e.]

P. padi was found in 1946 on diseased shoots of Norway Spruce from Nore, in Numedal, probably the first record of natural infection of Spruce shoots by this fungus. Later reconnaissance revealed infections in many localities in 6 counties of Norway, and it is believed that such damage will be discovered wherever the fungus is present on its alternate host, *Prunus padus*. Infections of Spruce have probably been overlooked in the past owing to the rarity or absence of aecia on the shoots. Diseased shoots are variously bent and may die back, and considerable damage may be caused to nursery plants and young trees in the forest, though in most localities the damage found was not severe. The identity of the pathogen was confirmed by inoculation of *Prunus padus*, on which uredinia were formed. Many of the aecia fail to open in the first spring but do so a year later, the aeciospores retaining their infective capacity. The chief means of control would appear to be removal of *Prunus padus*.

[700]. 44.3 : 12.25 : 12.21 (411–4). LAING, E. V. **Preliminary note on a disease of Sitka Spruce in Cairnhill plantations, Durris, Kincardineshire (*Picea sitchensis* Carr.).** *Forestry* 21 (2), 1947 (217–20). 8 refs. [Forestry Department, University of Aberdeen.]

An account of the occurrence of the wound parasite *Nectria cucurbitula* on *Picea sitchensis* [cf. *For. Abstr.* 3 (339)].

[701]. 44.3 : 12.25 : 12.21 : 23.26 : 12.11.15. KRASIL'NIKOV, N. A., and RAZNITSINA, E. A. Bakterial'nȳ metod bor'bȳ s fusariozom seyantsev sosnȳ. [**A bacterial method of controlling damping-off of Scots Pine seedlings caused by *Fusarium*.**] *Agrobiologiya* 1946 (5/6), (109–21). 35 refs. [Russ.russ.] H. S. B.

In 1938 preliminary tests were made of more than 200 strains of bacteria for possible antagonism to a virulent *Fusarium* which was causing mass damping-off of Scots Pine seedlings in the Botanical Garden of the Academy of Sciences of the U.S.S.R. These (pure-culture) tests showed that 17 strains were sufficiently active to induce dissolution of the fungal hyphae in 2–5

days. Of the remaining strains some acted similarly but more slowly, some merely retarded fungal growth, some stimulated it and some had no effect. As (1) autolysis of hyphae can occur, in the absence of bacteria, when growth and assimilation of the fungus are arrested, and (2) hyphae artificially killed are not dissolved in the presence of bacteria, it is inferred that the active strains may exert their effect by inhibiting the activity of the fungus to a point where autolysis occurs through the agency of the fungus' own enzymes.

In 1939–40 further experiments (replicated) were made *in vitro*, in pot and box cultures and in the field, using suspensions of pure-cultured bacteria, 'bacterialized' composts or 'bacterialized' peat, with seed either artificially infected with *Fusarium* or sown in heavily infected soil. The laboratory tests showed that only 6 strains of bacteria were sufficiently effective, the best belonging to the genera *Pseudomonas* and *Achromobacter*, and optimum results were obtained when the seeds were infected practically simultaneously with *Fusarium* and the bacteria. The most effective bacteria were No. 30 (a *Pseudomonas*) from '*zhitnyak*' [*Agropyron* Sect. *Euagropyron*?] compost and No. 77 [identity not specified] from 'bacterialized' peat, and in parallel tests, using the actual composts or peat, only these two gave positive results. In both pot or box trials and field trials, treatment with these two strains or with '*zhitnyak*' compost again gave the best results, lowering the incidence of and mortality from the disease by 70–90% as compared with controls, in addition to which the seedlings appeared to be stimulated in germination and growth. This was confirmed in supplementary experiments in which *Fusarium* was excluded, the greatest stimulation again being given by strain No. 30 or '*zhitnyak*' compost (in which this strain was abundant).

The results strongly suggest that the method may be a useful one in the control of damping-off, but it is stressed that further work is needed in different localities to study the conditions under which it may be so, e.g. possible variations in the susceptibility of local strains of the fungus and the ability of the bacteria to thrive in particular soils.

[702]. 44.3 : 12.25 : 12.21 (485) BJÖRKMAN, E. **Studier över snöskyttesvampens (*Phacidium infestans* Karst.) biologie samt metoder för** snöskyttets bekämpande. **[Studies on the biology of the snow-blight fungus and on control measures against snow blight.]** *Medd. SkogsforsknInst. Stockh.* 37 (2), 1948 (1–136). 100 refs. [Sw.e.]

A comprehensive review is made of researches by the author and other workers on this disease [cf. *For. Abstr.* 9 (No. 2552)], with discussions of the range and hosts of the fungus, the biology of infection, life conditions of the fungus (influence of temperature, moisture, snow cover etc., nutritional factors, pH and growth substances), resistance of various provenances of Scots Pine to attack, significance of the disease on the north Swedish Pine heaths, and control measures.

Indirect (silvicultural) control measures are considered more important than direct ones. Since the snow cover should be as thin as possible (in order to secure low temperatures in the snow surrounding young Pines), shelterwood or clear-felling methods should be used, preference being given, where possible, to clear felling. Attacks are less frequent where the snow melts rapidly, e.g. by stumps, fallen trees, or among topwood and branches. Fresh slash with needles, however, may be infective and should not be left among seedlings. Though no proper research has yet been done on this point, slash burning should in theory help both to destroy infective material, and, by its fertilizing effect, to bring regeneration quickly past the danger level. Having regard to snow conditions on the various aspects, artificial regeneration of Pine should be undertaken in the highlands only on S. slopes and plateaux, and Spruce used on N. aspects. Seed of a provenance a little farther N. than the plantation site is to be preferred. Regeneration by planting gives the least risk of *Phacidium* attack. If direct sowings are made, strips should be preferred to patches, as the latter are more easily overrun by the mycelium. Mixed Pine/Spruce sowings are not recommended, since if the Pine is heavily attacked, the Spruce may also be infected and killed.

Chemical control may not be practicable except in nurseries, but 100% control can be achieved by spraying with a lime-sulphur preparation ('California mixture', containing calcium polysulphides and calcium thiosulphate), applied in atomized form in the autumn, just before the snows.

Many other fungi have been investigated in connexion with the snow-blight studies, including a group of fungi injurious to Spruce seedlings in nurseries. One of these, referred to as the 'Spruce snow-blight fungus', is undescribed and represents a new genus in the Ascomycetes. Research on this group of fungi continues.

[703]. 44.3 : 12.25 : 07.2 : 12.11. PEHRSON, S. O. **Studies of the growth physiology of *Phacidium infestans* Karst.** *Physiol. Plant., Copenhagen* 1 (1), 1948 (38–55). 29 refs. [E.e.]

Discusses and tabulates the results of experiments to show the influence of temperature, pH and certain growth substances on the growth of a pure culture of the fungus. The optimum temperature proved to be 15° C. The pH optimum at 15° is about 5·5; its acidity increases with falling temperature. The growth stimulus of yeast extract is equalled, among the growth substances tested, only by a combination of thiamin and inositol. [Cf. *For. Abstr.* 9 (No. 2552).]

[704]. 44.3 : 12.26–8 : 12.21. THOMAS, H. E., *et al.* **Rootstock susceptibility to *Armillaria mellea.*** *Phytopathology* 38 (2), 1948 (152–4). [Division of Plant Pathology, Univ. of California.]

A summary of results obtained after 17 years' testing of 18 Plum varieties for resistance to *Armillaria mellea* at San José, California, in the search for an *Armillaria*-resistant rootstock for Apricot and Prune. Only 2 varieties warranted further tests. A second test of a number of other types of fruit and nut rootstocks showed *Ficus carica*, *Diospyros lotus*, *D. virginiana* and *Juglans lindsii* to have good resistance.

[705]. 44.3 : 12.26–8 : 12.21. CARRANTE, V., and RUGGIERI, G. Esperienze di inoculazione della *Deuterophoma tracheiphila* Petri. [**Experiments in the inoculation of *Citrus* trees with *Deuterophoma tracheiphila.***] *Ann. Sper. agr.* (*n.s.*) 1 (3), 1947 (463–71). 6 refs. [It.it.e.]

Inoculations with cultures of *Deuterophoma tracheiphila* isolated respectively from trees attacked by *mal nero* (the virulent form of *mal secco*) and from trees attacked by the ordinary slow form, showed that there is no foundation for the belief that two physiologically different forms of the parasite exist, one more pathogenic than the other. Careful examination showed that *mal nero* is a form of the disease in which the fungus first attacks the heartwood and advances very slowly with no external signs; it is not until the mycelium begins to act on the ascending sap that the disease begins to develop rapidly. *From authors' summary.* [Cf. *For. Abstr.* 10 (No. 109).]

[706]. 44.3 : 12.26–8 : 12.21. GOIDÀNICH, G., and RUGGIERI, G. Il carattere della resistenza dei *Citrus* al parassitismo della *Deuterophoma tracheiphila* Petri. [**The character of the resistance of some species of *Citrus* to the parasitism of *Deuterophoma tracheiphila.***] *Ann. Sper. agr.* (*n.s.*) 1 (3), 1947 (473–84 + 1 photo). 17 refs. [It.it.e.]

Germination tests with conidia and pycnospores of *Deuterophoma tracheiphila* were conducted in hanging drops of sap from both cortex and wood of sweet and bitter Oranges, these two species being respectively resistant and susceptible to *mal secco* disease. It was shown that these saps contain substances which somewhat stimulate the germinative energy and further development of the mycelium. No appreciable difference was observed between the species in this respect. It is concluded that the mechanism of resistance is not chemotropic in nature, and other possible explanations of resistance are discussed. *From authors' summary.*

[707]. 44.3 : 12.26–8 : 12.21. GOIDÀNICH, G., and RUGGIERI, G. Recenti osservazioni sulla biologia della *Deuterophoma tracheiphila* Petri e considerazioni sull'eziologia del 'mal secco' degli agrumi. [**Recent studies of the biology of *Deuterophoma tracheiphila* and the etiology of the 'mal secco' of *Citrus* trees.**] *Repr.* from *Rendiconti dell'Accademia Nazionale dei Lincei* (*Ser. 8*) 3 (3/4), 1947 (395–402). 16 refs. [It.] P.R.

[708]. 44.3 : 12.26–8 : 12.21 : 41. GOIDÀNICH, G., and RUGGIERI, G. Una rapida riproduzione sperimentale del 'mal secco' degli agrumi. [**A rapid method of artificially infecting *Citrus* species with *Deuterophoma tracheiphila.***] *Repr.* from *Ann. Sper. agr.* (*n.s.*) 1 (1), 1947. pp. 5. 7 refs. [It.it.e.] P.R.

[709]. 44.3 : 12.26–8 : 12.21. RILEY, C. G. **Heartrot of Oak caused by *Polyporus***

obtusus. *Repr.* from *Canad. J. Res.* 25C (5), 1947 (181–4 + 7 photos). 8 refs.

Polyporus obtusus is a heartwood-decaying fungus that attacks several American species of broadleaved trees, principally Oaks. It has a wide geographical range, but tends to occur in localized concentrations within which it causes great destruction, while elsewhere it is rarely found. On account of its peculiar distribution, *P. obtusus* is not well known, and the published references to it are comparatively few. A local concentration of the disease, the only one known in Canada, occurs at the Petawawa Forest Experiment Station, Ont. Here Oak trees 0·8–4·8 in. in diameter were being attacked. The resulting white rot continues to advance in the sapwood, ultimately causing the death of the tree. The large, cream-coloured, bracket-like sporophores are borne on the diseased trees in great abundance in some seasons, and are comparatively scarce in others. *Author's summary.*

[710]. 44.3 : 12.26–8 : 12.21. GOIDÀNICH, G., and CAMICI, L. **Un cancro del leccio prodotto da *Epidochium ilicinum* sp.n. [A canker of *Quercus ilex* caused by *Epidochium ilicinum* n.sp.]** *Ann. Sper. agr.* (*n.s.*) 1 (3), 1947 (521–31). [It.it.e.]

[711]. 44.3 : 12.26–8 : 12.21 (82). RAGGI, C. A. **Nota sobre un interesante caso de parasitismo del *Botrytis cinerea* Pers. sobre *Eucaliptus* sps. [Note on an interesting case of *Botrytis cinerea* parasitic on *Eucalyptus* spp.]** [*Publ.*] *Inst. Sanid. Veg.* (*Ser. A*) 3 (29), 1947. pp. 11. 5 refs. [Span.]

[712]. 44.3 : 12.26–8 : 12.21 : 42. RAYNER, R. W. **Latent infection in *Coffea arabica* L.** *Nature, Lond.* 161 (4085), 1948 (245–6).

During investigation of a disease of green coffee berries caused by a variety of *Colletotrichum coffeanum*, healthy leaf, green berry, stem and pedicel tissues were tested for the presence of latent infections. Practically every piece of tissue tested, down to 1 mm.-sq. pieces of leaf tissue, was found to produce fungal growth when cultured on prune agar. *C. coffeanum*, in a large variety of forms, was most frequently obtained, but a species of *Phoma* and a species of *Phomopsis* were also frequently isolated. The fact that these fungi are present as latent infections on almost all healthy coffee tissue, explains the constancy with which they fructify on tissues which have died from carbohydrate or nitrogen deficiencies, sunscorch etc., and explains why a number of physiological diseases have, in the past, been considered to be due to fungal attack. It was observed that certain forms of *C. coffeanum* and *Phoma* sp. were most frequently isolated from certain parts of the plant. Forms of *C. coffeanum* on leaves and stems appear never to cause disease symptoms; fructification only occurs when the bark dies or the leaves are shed. Thus the forms which make up the morphological series appear to be associated not only with different parts of the plant, but also with differing degrees of parasitism. [Cf. *For. Abstr.* 9 (No. 59).]

[713]. 44.3 : 12.26–8 : 12.21 (73). HATFIELD, W. C. **Shoot blight of Aspen and Poplar caused by species of *Fusicladium*.** *Abstr.* in *Univ. Wyo. Publ.* 12 (1/4), 1946 (73–4). *Rev. appl. Mycol.* 26 (12), 1947 (571–2).

Three species of fungi are stated to be concerned in the etiology of Aspen and Poplar shoot blight, viz. *Fusicladium radiosum* [*Venturia populina*], *F. elegans*, and *F. lageniformis* Solherin and Hatfield n.sp. Inoculation experiments with the two last-named showed that *Populus alba* var. *bolleana* was the most susceptible host species tested, followed in descending order by *P. tremuloides*, *P. nigra* var. *italica*, *P. angustifolia*, and *P. sargentii* (which was apparently immune to *F. elegans*). Optimum growth temperature for these two pathogens was also studied.

[714]. 44.3 : 12.26–8 : 12.21. MOOI, J. C. **Kanker en takinsterving van de wilg veroorzaakt door *Nectria galligena* en *Cryptodiaporthe salicina*. [Canker and die-back of Willow caused [respectively] by *N. galligena* and *C. salicina*].** Uitgeverij & Drukkerij Hollandia, Baarn. 1948. pp. 119. 75 refs. [Du.e.]

A thesis, describing research on these two diseases with particular reference to their attacks on *Salix alba* and *S. alba* var. *caerulea*.

(1) The section on *Nectria galligena* canker contains chapters on the isolation of and inoculation with the pathogen, its determination and culture, the pathological anatomy and development of cankers, analogies in the formation of other cankers on various species, periodic proliferation of *N. galligena* in cankers, influence of frost and frost damage, and the

ability of *N. galligena* to cause cankers on Apple and Poplar.

(2) The section on die-back caused by *Cryptodiaporthe salicina* deals with the occurrence of the disease, the influences of frost and wind, inoculation tests, experiments on the influence of temperature on attack by and growth of the fungus, description of the fungus, inoculations (some successful) of other species of *Salix*, and notes on other fungi found on trees affected by die-back. It was demonstrated in pure culture that the conidial stage of the pathogen is *Discella carbonacea*.

[715]. 44.3 : 12.26–8 : 12.21 : 41. CROWDY, S. H. **Treatment of Apple canker lesions with plant-growth substances.** *Nature, Lond.* 161 (4087), 1948 (320–1). [Department of Agriculture and Horticulture, Univ. of Bristol.]

The effect of a number of growth substances on *Nectria galligena*, the cause of Apple canker, was examined, on the assumption that a substance which stimulates wound healing, e.g. by callus formation, may prove as effective in combating the disease as one that aims at suppressing the pathogen, given that the formation and spread of a canker depends on the balance between the growth of the pathogen and the regenerative capacity of the host. A table is given showing the effect of 7 plant growth substances on the growth of the fungus on agar and in nutrient solutions; in all cases reduced growth resulted. In preliminary field trials cankers treated with β-indolylbutyric acid showed a marked improvement over the controls, but the others showed little difference. These failures may possibly be due to the use of concentrations high enough to be toxic to the host.

[716]. 44.3 : 12.26–8 : 12.21 : 41. MCCALLUM, A. W., and MACRAE, R. **Technique used in the diagnosis of Dutch Elm disease.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 3 (6), 1947 (4, 6).

44.4. *Virus Diseases*

See also *For. Abstr.* 10 (No. 694).

[717]. 44.4 : 12.26–8 (969). JENSEN, D. D. **A new virus disease of Papaya [*Carica papaya*].** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (67).

[718]. 44.4 : 12.26–8. HENDRIX, J. W., and MATSUURA, M. **Virus diseases.** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (103–4).

Investigations into the mechanism of transmission of ringspot of *Carica papaya* showed that the virus is not transmitted by seed and gave no evidence that the young developed seedling could pick up the virus from the soil. The virus can easily be transmitted mechanically by rubbing infective juices on healthy leaves.

[719]. 44.4 : 12.26–8 (969). LINDNER, R. C., IKEDA, W., and AWADA, M. **Papaya [*Carica papaya*] ringspot.** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (118–19).

45. DAMAGE BY ANIMALS

45.1 *Mammals*

See also *For. Abstr.* 10 (Nos. 9, 51, 145, 210, 216).

[720]. 45.1 : 07.7 : 13.2 : 23.6. SPENCER, D. A. **An electric fence for use in checking porcupine and other mammalian crop depredations.** *J. Wildlife Mgmt.* 12 (1), 1948 (110–11). [Wildlife Research Laboratory, Denver, Colorado.] B.A.P.

The dense quill of porcupine forms a perfect insulation to live wires. An electric fence which will exclude porcupine, therefore, needs wire netting up to a minimum height of 18 in. The netting is fixed to posts at 20–25 ft. intervals and has wooden stiffeners to prevent sagging under the weight of animals attempting to surmount it. The electric charge is carried by a smooth wire attached by porcelain insulators to the fence at a level with the top of the netting and never more than $1\frac{1}{2}$ in. distant from it. Netting and wire are held by a number of insulating links. The positive current is carried by the smooth wire and the negative by the netting and the ground.

[721]. 45.12 : 12.25 : 13.2 (776). **Porcupine damage to forests.** *Rep. Lake St. For. Exp. Sta.* 1947 (23).

In a study made in the Kawishiwi Exp. Forest, Minn., it was estimated that damage to Jack Pine averaged 47 cents per annum for each of 36 porcupines. In two other plantations (16-year-old Scots Pine and 12-year-old Jack Pine respectively) about 12% of the trees were injured, but the damage was greater than this

figure indicates, since the porcupines seem to prefer the larger trees (over 3 ft. d.b.h. and 14 ft. in height). Few trees are killed outright, but many are impaired in growth, form and soundness.

[722]. 45.12 : 12.25 : 13.2 (471) : 13.15. VARTIO, E. Oravan talvisesta ravinnosta Käpy- ja Käpykatovuosina. [**The winter food of the squirrel during cone and cone failure years.**] *Suomen Riista* No. 1, 1946 (49–74). 23 refs. [Finn e.] B.A.P.

In Finnish cone-producing areas, seeds of coniferous trees formed the greatest proportion of squirrel food (58%). Buds of coniferous trees formed 19%. Of the seeds of coniferous trees, 56% were Norway Spruce. In cone failure areas, buds of coniferous trees were the most important substitute (49%), grain and hay formed 11% and food from the ground 10%, though substitute foods varied according to the district. Of buds eaten, 95% were Spruce. One squirrel could handle as many as 10 shoots per minute. Inflorescence buds were most favoured. Peeling of trees, particularly Oak, was noticed here and there. Only the lower surface of the branches was affected. Squirrels had eaten, not the bark or cambium layer, but the fungus *Vuilleminia* found growing there.

[723]. 45.12 : 13.2 (776) : 42.31. VESALL, D., GENSCH, R., and NYMAN, R. **Beaver-timber problem in Minnesota's 'Big Bog'.** *Conserv. Volunteer* 10 (57), 1947 (45–50). B.A.P.

A report on damage to timber from beaver-caused flooding in the Littlefork Forest Area of Koochiching county, Minnesota, a tract of flat peat land originally drained for agriculture but later given over to timber-growing. Several hundred control dams were built in the ditches and this coupled with the rapid establishment of Aspen, Willow and Balsam (all beaver foods) seemed to encourage the spread of beaver throughout the whole network, beavers in some cases taking over the man-made control dams. The number of dams in 1946 averaged 2·5 per mile of ditch, enough to cause considerable flooding in flat country. Damage to timber, Christmas trees and pulpwood from flooding averaged 29 acres per mile of ditch. Most of the timber affected was Black Spruce. In addition to trees killed, nearly 6 cords of timber per mile of ditch are lost annually through the stoppage of growth, a total timber loss valued at $4651.00 in the market, per mile of ditch. A comparison of beaver and timber annual crop values shows; for beaver, 0·8 per mile of ditch, market value $26.00; for timber, nearly 6 cords per mile of ditch, market value $76.70.

[724]. 45.12 : 13.2 (94). BARNES, T. C. **A method of rabbit control in western lands.** *N.S.W. For. Rec.* 1 (1), 1948 (48–50).

Australian rabbits usually surround their warrens with a bank formed of earth excavated from burrows, for the purpose of excluding flood water. The method of destruction here described consists in suddenly introducing a large quantity of water into the warren during heavy rain by previously constructing one or more catchment furrows converging on the centre of the warren, the direction of the furrows being determined by the slope of the catchment area. After rain, the warren becomes so quickly filled with water that escape is impossible, the rabbits are drowned or smothered, and eventually the warren collapses. A good growth of grass and herbaceous plants quickly occurs on the collapsed areas. The treatment of the warrens was carried out on a Western Lands Lease at the same time as the construction of contour furrows. About 1,000 warrens were treated in the construction of 1,500 miles of furrows. The plough was not lifted from the ground in establishing furrows from one warren to another. The length of the catchment furrows to the warrens was 30–50 yards in favourable catchments, and 175–250 yards in flat country. Shallow furrows not more than 5 in. deep are necessary. Over 100 warrens inspected later were found to contain a heavy growth of valuable grass and herbaceous vegetation, and no sign of rabbits were seen on the treated areas. If the furrows are kept open the rabbits would again be destroyed if they attempted to re-open a treated warren.

[725]. 45.12 : 13.2 (73) : 13.15. LEOPOLD, A. **Deer irruptions.** *Publ. Wis. Conserv. Dep.* No. 321, [1943?] (3–11). 27 refs. *Repr.* from *Bull. Wis. Conserv. Dep.* August, 1943. B.A.P.

Histories of 4 irruptive deer herds show a common pattern in the effects of browsing on woody vegetation. As the herd increases, pressure on palatable species ultimately kills them and prevents both natural and artificial regeneration. Unpalatable species eventually

replace the palatable ones. In overbrowsed Wisconsin deer yards (winter concentration areas) White Cedar [*Thuja occidentalis*], Striped Maple [*Acer pennsylvanicum*], Red Maple [*Acer rubrum*], Red Dogwood [*Cornus florida rubra*?] and Ground Hemlock [*Taxus canadensis*], all palatable, are being replaced by Alder, Aspen and White Birch, all unpalatable. Trees above the reach of the deer are browsed up to a level of 6–8 ft. and the species that show such a 'deer-line' are a sensitive index to the degree of deer pressure. A new deer-line on Balsam plus an older one on White Cedar shows an advanced stage. On the Kaibab plateau, Arizona, deer pressure was first visible on Cliff-rose [*Cowania mexicana*], and, as this good food became scarce, Juniper and finally Piñon Pine were taken. In Pennsylvania deer pressure was first visible on Oaks, Cherry, Ash, Maples, Ground Hemlock and Hemlock. As these became scarce, Laurel, Rhododendron and Pines were taken.

45.3. *Insects*

See also *For. Abstr.* 10
(Nos. 81, 131–3, 140, 152, 659, 766).

[726]. 45.3 : 07.7. RIPPER, W. E., and TUDOR, P. **The development of a helicopter spraying machine.** *Bull. ent. Res.* 39 (1) 1948 (1–12 + 8 plates). 10 refs.

A preliminary report on experiments in using the interference of the helicopter slip-stream with the vegetation to obtain a high dynamic catch of spray droplets.

[727]. 45.3 : 41. FREAR, D. E. H. [Compiler]. **A catalogue of insecticides and fungicides. Vol. I. Chemical insecticides.** Chronica Botanica Co., Waltham, Mass.; Wm. Dawson & Sons, Ltd., London, W.C.2. 1947. pp. xii + 203. Price $6.50. I.F.B.

[728]. 45.3 : 41. CREIGHTON, J. T. **New developments in insecticides and application equipment. Part I. Present status of Velsicol 1068 (Chlordane) as an insecticide. Part II. Other recent insecticidal developments.** *Proc. 23rd nat. Shade Tree Conf.* 1947 (106–21). 15 refs.

[729]. 45.3 : 41 : 07.7. BATEMAN, E. W., and HEATH, G. D. **The generation of insecticidal smokes.** *J. Soc. chem. Ind., Lond.* 66 (9), 1947 (325–30). 3 refs. P.R.

Discusses the selection of the vaporizer and the insecticide and the optimum ratio between them, and, with illustrations, the design of an insecticidal smoke generator. Describes and tabulates the results of experiments to assess (from the amount of DDT recovered) the relative efficiency of DDT with different proportions of sucrose and potassium chlorate as vaporizer; the constituents of the smoke of the selected composition were isolated as a check on the results. Incomplete experiments using benzene hexachloride indicate a higher efficiency than that of commercial DDT. The effect of these smokes on insects is briefly mentioned.

[730]. 45.3 : 41. EATON, J. K. **The formation of phosgene from DDT and related compounds.** *Rep. E. Malling Res. Sta. 1946*, 1947 (129–30). 5 refs.

A reported evolution of phosgene on mixing DDT and copper oxychloride has not been confirmed. Only under conditions of vigorous oxidation not likely to be encountered in agricultural practice has phosgene been produced from DDT and certain related compounds.

[731]. 45.3 : 41 : 13.15 : 13.2 (74). BRUES, C. T. **Changes in the insect fauna of a New England woodland following the application of DDT.** *Harv. For. Pap.* 1 (1), 1947 (1–18). 4 refs.

The data obtained in this study are presented in a number of tables and are discussed in detail. The author concludes that it may safely be accepted that a moderate amount of DDT spraying in New England woodlands will cause no serious changes in the prevailing insect fauna.

[732]. 45.3 : 13.2 (431–5) : 41. THIEM, H. Die Maikäferbekämpfung mit neuzeitlichen Insektengiften. [**Cockchafer control with modern insecticides.**] *NachrBl. dtsch. PflSchDienst* (*n.s.*) 1 (1; 2), 1947 (4–5; 26–8). 2 refs. [G.]

Very briefly reviews the recent history of cockchafer control up to the advent of Gesarol (DDT) and reports in more detail on the successful use of 2% Gesarol, applied twice as a spray from the ground (on the flatter land) and once as a dust from the air (on steeper slopes), against a chafer infestation in orchards at Seeheim, Bergstrasse. The treatments, performed during the main flight of the chafers in early May,

1944, are estimated to have killed about 90% of the beetles. No serious damage from grubs is now likely, and the main flight of 1947 should be only ⅓–¼ as heavy as the previous one. Simultaneously, quite good control of some other fruit-tree pests was obtained. The health of sprayer operators was unaffected; there was no injury to the trees or other crops on the treated areas; and bee-keepers, at first apprehensive, have made no complaints. Suggestions are put forward for the organization of chafer control with DDT in such country.

[733]. 45.3 : 12.25 : 13.2 (944) : 12.26–8. TAYLOR, K. L. **Forest insects in New South Wales: The mottled cup-moth (*Doratifera vulnerans*): The Pine bark weevils (*Aesiotes* spp.).** *N.S.W. For. Rec.* 1 (1), 1948 (42–7).

[734]. 45.3 : 13.2 : 23.22.2 (436) : 34.2. LUSTIG, E. Zwischenkultur im Forst als Forstschutzmassnahme bei der Russelkäferbekämpfung. **[Intercropping in the forest as a form of forest protection in the control of weevils.]** *Allg. Forst- u. Holzw. Ztg.* 58 (13/14), 1947 (105–6). [G.]

It is claimed that agricultural or other intercropping on regeneration areas [cf. *For. Abstr.* 10 (Nos. 193–4)] can be a material factor in the control of *Hylobius abietis* and other beetles with a similar mode of life, since (*a*) early cultivation of the soil disturbs them in their winter quarters and exposes them to predators and weather, and (*b*) the temporary crop renders the general environment less favourable and less attractive to them. Thus a mixed crop of oats and rye is said to protect the young forest crop for at least the first two, most hazardous, years; the effect may be prolonged on suitable sites by following with a crop of pumpkins and sunflowers in the third year or with perennial lupin for a still longer period. Scattered sunflowers may be left after harvesting to attract birds to the area. Lupins will not give sufficient cover in their first year, but if they are sown simultaneously with the planting of the trees, a crop of pumpkin and sunflower can still be grown for that year. A further effective combination against *Hylobius* is intercropping in strips with *Atropa belladonna* and species of *Artemisia*. This crop makes few demands on the site, usually lasts for 5 years, and will give useful yields with little expenditure of labour.

It is noted in conclusion that intercropping may also reduce game damage, e.g. in a young Spruce stand which had previously suffered constantly from deer browsing, no such damage was observed when the stalks of tree mallow (*Althea rosea*, grown for a dyestuff in the flowers) were left standing and thus furnished winter fodder even when the snow was deep.

[735]. 45.3 : 12.25 : 13.2 (410). THREIPLAND, P. W. M. **Notes on the attack by Pine weevil (*Hylobius abietis*) on a plantation of Scots Pine and Japanese Larch.** *Quart. J. For.* 42 (2), 1948 (109–11).

The infestation was successfully arrested by timely hand picking. Small-scale experiments with various types of spray and trap baits were inconclusive.

[736]. 45.3 : 12.25 : 13.2 (711). RICHMOND, H. A. **Hemlock looper salvage study.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (1), 1948 (3–4).

Report on a sample-plot study of mortality in British Columbia. Some recovery has taken place, but it is very localized. Douglas Fir showed most, then Hemlock and Spruce. Mortality has been heaviest in Hemlock. Recovery is unlikely after 90% defoliation and some trees died after 80%.

[737]. 45.3 : 12.25 : 13.2 (436). SCHIMITSCHEK, E. Zum Nonnenauftreten in Österreich. **[The occurrence of the nun moth in Austria.]** *Allg. Forst- u. Holzw. Ztg.* 58 (1/2; 5/6), 1947 (4–7; 38–41). 8 refs. [G,]

A review of past epidemics, their distribution and causes; methods of determining population density; and control measures. [Cf. *For. Abstr.* 8 (No. 2741).]

[738]. 45.3 : 12.25 : 13.2 (436). KURIR, A. Kartographisch dargestellte Massenvermehrungsgebiete der Nonne (*Lymantria monacha* L.) in Österreich von 1888 bis 1946. **[Sketch-map of the mass outbreaks of the nun moth in Austria from 1888 to 1946.]** *Allg. Forst- u. Holzw. Ztg.* 58 (9/10), 1947 (80–2).

[739]. 45.3 : 12.25 : 13.2 (436) : 22.8. FRÖHLICH, J. Einige Bemerkungen zur Karte über die Massenvermehrungsgebiete der Nonne in Österreich. **[A few remarks on the map of areas where mass outbreaks of the nun moth have occurred in Austria.]** *Allg. Forst- u. Holzw. Ztg.* 58 (17/18), 1947 (144–5). 1 ref. [G.]

Points out that Kurir's map of nun-moth outbreaks in Austria shows that these have all occurred in areas where Norway Spruce has largely supplanted mixed forests, and pleads for a return to the latter.

[740]. 45.3 : 12.25 : 13.2 : 13.15. BROWN, N. R. **Spread of an imported predator of the Balsam woolly aphid.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 3 (6), 1947 (6–7).

Leucopis obscura was introduced into the Maritime Provinces in 1933, 1934, 1936 and 1941 to help combat *Adelges piceae*, upon which its larva is predacious. In the 14 years since its first liberation, this small fly has spread as far as 110 miles from the release points. Preliminary studies on its effectiveness indicate that a medium to heavy attack by the aphid is necessary before the predator becomes well established.

[741]. 45.3 : 12.25 : 13.2 : 21.8. MORRIS, R. F. **[Balsam Fir] foliage analysis.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (1), 1948 (1).

Detailed analysis of the foliage and flowering habits of Balsam Fir was continued in 1947. A very heavy crop of flowers being borne in that year, a quantitative comparison was attempted between the foliage produced in 1947 and that produced on the same trees in 1946, when there were practically no flowers. Flower production caused a drastic reduction in the amount of foliage produced, affecting both the number and length of shoots and the number and size of needles. This reduction was clearly related to the amount of flower production, both as between different trees and between different crown sections on the same tree; the effect being most striking in the top 15–20 ft. of crown where the heaviest flower crop appears. On mature trees, the total weight of foliage produced in 1947, was, on the average, only 40% of the corresponding weight for 1946. The implications of this for the appraisal of budworm populations are pointed out, and in particular the probability of error if annual defoliation records are used as an index of insect abundance. The degree of defoliation of new shoots could be more than doubled in a flowering year, without any increase in numbers of larvae. It is possible that this factor plays a part in determining the greater vulnerability of old, dominant and co-dominant Balsam Fir trees to budworm damage: these are the trees which produce heavy crops of flowers, and it is obvious that in flowering years they will get stripped of their foliage much more readily than smaller trees with a normal complement of foliage. Periodicity in flower production is much less evident on Spruce and there is no significant effect on the amount of foliage. [Cf. *For. Abstr.* 9 (No. 1304).]

[742]. 45.3 : 12.25 : 13.2 (436). SCHUSTER, W. Auftreten des grauen Lärchenwicklers (*Tortrix* (*Grapholitha*) *pinicolana* (*diniana*)). **[Outbreak of the grey Larch tortrix.]** *Allg. Forst- u. Holzw. Ztg.* 58 (15/16), 1947 (127). [G.] SCHEDL, K. E. Zum Auftreten des grauen Lärchenwicklers in Kärnten und Ost-tirol. **[On the outbreak of *Semasia diniana* in Carinthia and E. Tirol.]** *Allg. Forst- u. Holzw. Ztg.* 58 (17/18), 1947 (143). [G.] KURIR, A. Lärchenwickler (*Semasia diniana* Gn.) -Gradation in Kärnten 1947. **[The 1947 Larch tortrix epidemic in Carinthia.]** *Allg. Forst- u. Holzw. Ztg.* 58 (19/20), 1947 (158–60). 11 refs. [G.]

Schuster reports an epidemic in the Larch/Norway Spruce/Cembran Pine forests of the Mölltal, at 1,500–1,900 m. altitude. Only Larch [*Larix decidua*] had so far been attacked. The attacks occurred on both shady and sunny aspects.

For E. Tirol, Schedl reports outbreaks especially in pure Larch woods at 1,600–1,900 m. altitude in several valleys. The attacks, which were strictly confined to this altitudinal zone, were not restricted to any particular aspect.

Kurir estimates the affected area in Carinthia at 4,000 ha., describing attacks in the Maltatal, Leobengraben and Liesertal, as well as that reported by Schuster. In these valleys pure Larch woods, as well as Larch in the mixed forest, were attacked. The zone affected was that between 1,400 and 1,800 m. altitude, with sporadic cases of infestation down to 1,200 m. The first attacks occurred on shady, N. slopes and only later on S. aspects. In Carinthia, attacks by *Coleophora laricella*, which had been severe in the preceding year, declined as those of *S. diniana* increased. As epidemics of the latter species are known to last 2–3 years, 1948 is likely to be the peak year. Control is

impossible unless contact insecticides (e.g. DDT) and aircraft are available, which appears to be extremely improbable.

[743]. 45.3 : 12.25 : 13.2 (71) : 13.12. Bird, F. T. **Control effects of the polyhedral disease of the Spruce sawfly.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (2), 1948 (1).

It has been shown that this disease, which terminated the severe outbreak of European Spruce sawfly (*Diprion polytomum*) is caused by a virus which can be stored and established artificially in areas where it is not present. It has been observed in the field for 10 years and no change has been observed in its virulence. The only factor necessary for its ability to destroy the insect is a sufficient number of the host in the forest, and this number has been found to be quite small.

[744]. 45.3 : 12.25 : 13.2 (436). Kurir, A.; Strobl. Buchdrucker (*Ips typographus* L.). Kalamität im Raume von St. Valentin und Amstetten 1946–47. [**Outbreak of *Ips typographus* in the St. Valentin and Amstetten region, 1946–47.**] *Allg. Forst- u. Holzw. Ztg.* 58 (15/16; 19/20), 1947 (125–7; 160–2). [G.]

Kurir describes outbreaks on 3 areas, totalling 1,000 ha., in the Herzograder Wald, Koettinger Holz/Haidenfeld, and Forst-Haide, attributing their origin in the first case to bomb damage (the Nibelungenwerk in this area was a target for Allied bombers); in the second to the diversion of a railway through the woods, during which operation the timber cleared was left at the sides of the clearing; in the third, to storm damage (windthrown and broken trees). *I. acuminatus* and *P. polygraphus* accompanied *I. typographus* as secondary pests. There appeared to be little chance of adequate control.

Strobl, on behalf of the Landesforstinspektion, repudiates Kurir's remarks about control and claims that the outbreaks have been suppressed, partly with the aid of calcium arsenate.

Kurir replies, *inter alia*, that suppression of the outbreak cannot be assumed until the spring of 1948, when damage at present invisible may become evident. He emphasizes that calcium arsenate is not only dangerous to man and many animals, but is ineffective against beetles and larvae which live under the bark. In Kurir's opinion control should be effected by using the trap-tree method in combination with a modern contact insecticide, e.g. DDT [cf. *For. Abstr.* 10 (No. 746).]

[745]. 45.3 : 12.25 : 13.2 (436) : 42.1. Schimitschek, E. Vorkehrungsmassnahmen nach Sturmschäden. [**Precautionary measures after storm damage.**] *Allg. Forst- u. Holzw. Ztg.* 57 (7/8), 1946 (54–7). [G.]

A summary of practical measures to prevent the breeding of insect pests, chiefly bark beetles, in windthrown trees.

[746]. 45.3 : 12.25 : 13.2 (494). Schneider-Orelli, O. Richtlinien zur Borkenkäferbekämpfung in den schweizerischen Wäldern für 1948. [**Principles for bark-beetle control in the forests of Switzerland in 1948.**] *Schweiz. Z. Forstw.* 99 (1), 1948 (71–81). [G.F.]

This notice is aimed chiefly at *Ips typographus* [cf. *For. Abstr.* 9 (No. 580)], as it is of urgent importance to deal with the foci of infestation in Switzerland while they are still comparatively small. The measures prescribed are: (*a*) Preventive—e.g. regular inspection of threatened stands, removal of unhealthy and infested trees, clearing coupes of unbarked debris, and getting coniferous wood quickly out of the forest. (*b*) Direct suppression—All infested wood should be barked over a cloth (ticking; $6 \times 2{\cdot}5$ m.) and the bark burnt. The felling of trap trees is absolutely indispensable for the control of the spring swarms. The trap trees (at least one per 4 ares) should be inspected, and if they are already infested, the affected portions should be barked as described above. They should be left about in the light shade of marginal trees or, if the area cleared is large, in the open also. Spring swarming generally occurs in mid-April but may be 14 days earlier or up to 2 months later. The traps should be barked 3 weeks after the main flight, and must in any case be dealt with before the new generation emerges. If barking is done late, in warm weather, it is advisable to dust the tree before barking and the bark on the cloths with a 666 preparation, but it is better to do the barking earlier, and in any case, chemical control can at present only supplement the other measures prescribed.

[747]. 45.3 : 12.25 : 13.2 (494) : 92. Gonet, C. Borkenkäfer und Strafgesetzbuch. [**Bark beetles and the penal code.**] *Schweiz. Z. Forstw.* 99 (3), 1948 (126–7). [G.F.]

Justification for the imposition of penalties in connexion with the campaign against *Ips typographus* in Switzerland is to be found in Art. 233 of the new Penal Code in force since Jan. 1942, which lays down that:—

(1) Any person intentionally contributing to the distribution of an agricultural or forest pest shall be liable to imprisonment. If the malice of the delinquent has resulted in considerable damage, the maximum penalty shall be imprisonment up to a period of 5 years.

(2) In cases of negligence the penalty may be imprisonment or a fine.

[748]. 45.3 : 12.25 : 13.2 (44). [AUBERT, S.] Les invasions d'insectes dans les peuplements résineux de la région Sélestat-Ville. **[Bark-beetle infestations of coniferous stands in the Sélestat-Ville region of the Vosges.]** *Bull. Com. For., Paris* 12 (80), 1947 (932–5). [F.]

Describes the building up of an infestation of *Ips typographus* and *Ips curvidentatus* in the Spruce and Fir stands of this region. The principal cause appears to be the extremely dry local climate, and the fact that Fir, owing to its great power of reproduction, has established itself here, and Spruce has been artificially established, outside their optimum range. The suggested remedy is the introduction of Pine and Beech, and protection of such plantations from the encroachments of Fir regeneration.

[749]. 45.3 : 12.25 : 13.2 : 43.3 (44). Invasions d'insectes dans la forêt de pin maritime des landes de Gascogne. **[Insect infestations in the *Pinus pinaster* forests of the *landes* of Gascony.]** *Ann. Éc. Eaux For. Nancy* 10 (1), 1946 [1947] (103–12). [F.f.]

Notes on infestations of *Ips stenographus*, *Xyleborus eurygraphus*, *Hylobius* spp., *Pissodes* spp. and *Monochamus galloprovincialis*. Recommended control measures against bark beetles are the barking of all wood exceeding 30 cm. in girth immediately after felling, the barking of all stumps, and forbidding all thinning of young, unbarked Pine, during the growing season; against *Hylobius* spp., the barking of all stumps and no replanting for at least 2 years after felling; against *Pissodes* spp., pulling up and burning all infected young plants, recognizable by their yellowing needles.

[750]. 45.3 : 12.25 : 13.2 (45) : 13.15. RUSSO, G. Scolitidi del pino del littorale toscano. **[Pine bark-beetles of the Tuscan coast.]** *Repr.* from *Bollettino dell'Istituto di Entomologia della Università di Bologna* 15, 1946 (297–314). 7 refs. [It.it.] I.I.E.

The author reports the results of his biological researches on the bark-beetles attacking *Pinus pinaster* and *P. pinea* in the coastal areas of Tuscany. The species observed were *Blastophagus* (*Myelophilus*) *piniperda*, *Hylurgus ligniperda*, *Crypturgus pusillus*, and *Ips erosus*, of which only the first is of economic importance. He has established that, contrary to the usual belief, both adults and larvae of *B. piniperda* hibernate, the adults partly in feeding tunnels in twigs (they are never found hibernating in the soil, litter, or stumps), and that the egg tunnels run downwards, not upwards as is generally stated. The egg is described for the first time, and notes are given on predators and parasites. The feeding and breeding tunnels and the egg of *H. ligniperda* are described and short notes given on the biology of *C. pusillus* and *Ips erosus*.

[751]. 45.3 : 12.25 : 13.2 (411–4). C[ROOKE], M. **A rare species of *Pissodes* in a new habitat.** *Scot. For.* 1 (3/4), 1948 (19–20).

A record of the occurrence of *Pissodes validirostris* on Scots Pine in Angus in 1947. The larvae of the beetle were parasitized to the extent of some 25% by an ichneumon, *Ephialtes sagax* var. *laticeps*.

[752]. 45.3 : 12.25 : 13.2 (411–4). CROOKE, M. ***Pissodes validirostris* Gyll., in shoots of *Pinus sylvestris* L.** *Forestry* 21 (2), 1947 (221–6 + plates). [Forestry Department, University of Aberdeen.]

Leading shoots of infested *Pinus sylvestris* in Scotland were found to contain larvae of *Pissodes validirostris*, known on the Continent as the cone-boring species of the genus. The species has been recorded only once before in Britain, and its occurrence in shoots appears to be unique. The beetle and the damage caused are described. Each shoot contained an average of 3 or 4 larvae, which bored up the interior of the shoot and were usually restricted to the basal 6 in. The tunnels were filled with a fine, light brown compacted frass. Since the remainder of the shoot tissue was usually dark brown, the structure being almost completely destroyed, the bark dead and the needles fallen, it must be assumed that most infested shoots would die. Observations on the life cycle

showed a very high rate of mortality in the immature stages of the beetle, partly due to a high rate of parasitism. Two of the parasites, *Ephialtes sagax* var. *laticeps* Ratz. and *Calyptus mucronatus* Thunb., were reared. The beetle is not yet important enough to be classed as a serious forest pest. Cutting out and destroying infested shoots about mid-July is thought to be the best control measure.

[753]. 45.3 : 12.25 : 13.2 (431–5) : 41. SCHWERDTFEGER, F. Bekämpfung des Kiefernspinners (*Dendrolimus pini* L.) durch Bestäubung. **[Control of *D. pini* by dusting.]** *NachrBl. dtsch. PflSchDienst.* (*n.s.*) 1 (4), 1947 (69–70). [G.]

Trials of several insecticides, applied by power duster, were made in April–May, 1947, against a serious infestation of *D. pini* in the Gartow forest district, Dannenberg (on the Elbe). (1) *Dinitrocresol* dust (Borchers' 'K III'; content of active ingredient 12%) gave mortalities of 75% at 50 kg./ha. and about 98% at 90 kg./ha., most of the larvae dying within 24 hours of the dusting. The effectiveness of this preparation was not, however, uniform or reliable, and decreased with increasing age of larvae, especially in warm dry weather. (2) *Gesarol* (5% DDT) gave 98% mortality at 65 kg./ha. and about 99% at 120 kg./ha., acting rather faster than (1). (3) *E 605* (made by Bayer, Leverkusen; content of active principle [not specified] 2%) was the most rapid in its action on the larvae and gave mortalities of 90% at 55 kg./ha. and 100% at 110 kg./ha. (4) *Calcium arsenate* (8% As) was unsatisfactory.

Though Gesarol and E 605 are presumably more effective and less injurious to animals and plants than is dinitrocresol, the tests with them were on a small scale and should be repeated.

[754]. 45.3 : 12.25 : 13.2 (71). BALCH, R. E. **An unusual outbreak.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (2), 1948 (1).

Account of an outbreak of *Pineus pinifoliae* in the Maritime States of Canada. The species alternates between Red Spruce and White Pine and has caused the most injury in mixed stands of these two species. Young stands have shown the greatest damage. Only a few scattered trees have died and the chief effects to date have been a reduction in the amount of foliage and wood growth which tends to the suppression of White Pine by other species. The Spruce is not seriously affected. The minute offspring of the overwintering form on Spruce crawl to the new shoots, which they cause to grow into loose galls. From these a winged form appears, which flies to the needles of White Pine where eggs are laid. It is the 'crawlers' from these eggs which cause the damage to the young shoots. There are apparently two forms, a wingless form on the Pine and a winged form which flies back to the Spruce to produce a bisexual form which is the parent to the over-wintering mother of the gall-formers.

[755]. 45.3 : 12.25 : 13.2. [CHRYSTAL, R. N.] **Experiments on the use of 'Tanglefoot' for prevention of *Adelges* migration from tree to tree or from one branch to another.** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (13–15).

The initial object of these experiments was to determine the degree of protection afforded to shoots and at the same time to study variation in development of attacked and unattacked shoots. In one case the tanglefoot bands were used to protect the whole tree from infection, and were completely successful. In a study plot at Kennington a number of trees of about the same height and vigour were selected; half of them were artificially infested with *Adelges* and kept, as far as possible, at a saturation density of attack; the remainder were protected by tanglefoot bands. Comparisons made in July showed that the shoots of the current year on infested trees were of a yellow colour, with much needle distortion and a measurable reduction in shoot length compared with controls. In other cases, selected trees were pruned of various percentages of foliage, and saturation infestation carried out. So far, trees with half their foliage removed and the remainder infested up to saturation point are still living and show a current shoot growth equal to that of infested trees which were not defoliated. It has been noted that there are differences in severity of infestation on what are apparently different strains of Douglas Fir. It was once more observed that *Adelges* avoid unhealthy trees, all trees at Tubney with fungus disease of the roots being clear of *Adelges*.

[756]. 45.3 : 12.26–8 : 13.2 (439). [SURÁNYI, P.] **The fall webworm of North America**

in Europe. *Nature, Lond.* 161 (4092), 1948 (512).

The first specimen of the moth of the fall webworm (*Hyphantria cunea* Drury) to be caught in Europe was found in the vicinity of Budapest in 1940. Its rate of increase since then shows that its caterpillar has found very favourable conditions in Europe. Nests of the caterpillars were first observed in 1943, and during 1945–46 they did considerable damage in orchards and on various trees. The area of distribution now covers two-thirds of Hungary, has reached the borders of Czechoslovakia and Jugoslavia, and is approaching those of Austria and Rumania. It is seldom observed north of Budapest, probably owing to the prevailing N. to NW. wind. Its favourite feeding plants (the same as in N. America) are *Acer negundo* and *Morus alba*, from which it strips the leaves in groves and along roads; but it feeds on all fruit and garden trees, and (what is more dangerous) has established itself also in the forests. Fifty-eight species belonging to different genera are known to be food plants: they include Oaks (*Quercus* spp.), Alder (*Alnus glutinosa*), Black Locust (*Robinia pseudoacacia*), common stinging nettle (*Urtica dioica*), cabbage (*Brassica oleracea*), and horseradish (*Armoracia lapathifolia*). Two generations normally hatch in a year and the caterpillars are apparently seldom parasitized by European species.

[757]. 45.3 : 12.26–8 : 13.2 (73) : 13.15 : 11.44. Bess, H. A., Spurr, S. H., and Littlefield, E. W. **Forest site conditions and the gipsy moth.** *Bull. Harv. For.* No. 22, 1947. pp. 56. 29 refs.

Contains three papers: (1) The relation of forest and site to gipsy moth abundance. (2) The ecology of susceptible and resistant forest types and stands. (3) The rôle of silviculture in maintaining conditions unfavourable to the moth. Investigations in different types of woodland showed a far higher mortality rate of larvae in deep litter than of those that failed to reach the ground; also that pupae exposed in the litter of relatively dense mesophytic forests were destroyed in large numbers, while few of those exposed in comparatively open, dry stands were destroyed. Apparently the small mammals and predaceous arthropods which inhabit deep accumulations of litter are responsible for this mortality. Well managed, fully stocked stands with undisturbed litter usually prove resistant to gipsy-moth attack.

[758]. 45.3 : 12.26–8 : 13.2 (44). Cointat, M. Remarques sur une invasion de *Lymantria dispar* L. dans le cantonnement d'Uzès. **[Notes on the gipsy moth attack in the forest reserve of Uzès (Gard).]** *Rev. Eaux For.* 86 (1), 1948 (12–32). [F.]

A study was made of the serious infestation by *Lymantria dispar* caterpillars of the *Quercus ilex* coppice forests of the Garrigues region of Haut Gard. The foci and direction of advance of the pest are described and the influence of environment, character of stand and human interference analysed. The nature of the damage and possible remedies are outlined. It is concluded that the infestation is fostered by dryness and light and that everything which increases humidity and shade in the stand diminishes its intensity. The direction of the advance is determined by the prevailing wind. Old coppice is always apt to provide a focus of invasion if it is unable to form a closed canopy. Young stands are relatively immune, probably because they do not provide suitable surfaces (old rough bark) for oviposition. It is considered that the best method of preventing infestation is to increase the normal coppice rotation from 25 to 30 years, thereby ensuring the formation of those damp and shady conditions which exclude the insect. Old stands lacking a closed canopy should, however, be exploited as soon as possible.

[759]. 45.3 : 12.26–8 : 13.2 (436). Kurir, A. Auftreten der Buchenblattbaumlaus (*Phyllaphis fagi* L.) auf der Rotbuche in Weidlingbach und Umgebung im Jahr 1946. **[Occurrence of *P. fagi* on *Fagus sylvatica* in Weidlingbach and its vicinity in 1946.]** *Allg. Forst- u. Holzw. Ztg.* 58 (13/14), 1947 (111). 4 refs. [G.]

[760]. 45.3 : 12.26–8 : 13.2 : 23.23.1. Peterson, L. **Tree-seed insects.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (2), 1948 (2–3).

Studies are being pursued at the Forest Nursery Station, Indian Head, Saskatchewan, on the chalcid infesting *Caragana* seeds. The Russian species [*C. frutex*?] was most heavily infested (67–78% of seeds). The degree of infestation of the Siberian species [*C. arborescens*?] was 11–28% and of the pygmy species [*C. pygmaea*] 15–23%. Early flowering were

more heavily attacked than late flowering plants. Late flowering varieties were, on the whole, uninfested.

[761] 45.3 : 12.26–8 : 13.2 (969). HOLDAWAY, F. G., and NISHIDA, T. **Control of the Monkey Pod caterpillar.** *Rep. Hawaii agric. Exp. Sta. 1945–6*, 1947 (75–6).

The caterpillar of the Noctuid moth *Polydesma umbricola* is a serious defoliator of leguminous trees, especially *Pithecellobium saman*, in Hawaii. Prolonged attack results in the formation of galls and often the death of terminal twigs and branches. Cage and field studies indicate that sprays of DDT and of lead arsenate, both at concentrations of 2 lb./100 gal., give effective control, DDT being rather superior.

[762]. 45.3 : 12.26–8 : 13.2 (68). NAUDE, T. J. **Control of insect pests. Forest insects. Wattle bagworm** (*Acanthopsyche junodi*). *Fmg. S. Afr.* 22 (261), 1947 (1066–7). E.M.B.

Acanthopsyche junodi infestation is now severe on 100,000 acres of Wattle in South Africa, the most extensive heavy incidence on record. Some 2,200 acres are scheduled to receive aerial dusting in 1947–48. Benzene hexachloride (3%) is inferior to cryolite, but a higher concentration promises better results. Benzene hexachloride smoke was ineffective against 4th-instar larvae, but holds promise if applied on the 1st and 2nd instars. [Cf. *For Abstr.* 2 (328, 329).]

[763]. 45.3 : 12.26–8 : 13.2 (68). NAUDE, T. J. **Control of insect pests. Forest insects. Eucalyptus snout beetle** (*Gonipterus scutellatus*). *Fmg. S. Afr.* 22 (261), 1947 (1066). E.M.B.

The control of *Gonipterus scutellatus* by the parasite *Anaphoidea nitens* is well stabilized at lower altitudes in South Africa. Problem areas still exist at higher altitudes, but even here, in the worst areas, at least 50% control has been attained. An analysis is being made of factors influencing control and especially of the effects of altitude, rainfall and low temperature in the higher and drier areas on the parasite through tree condition and host abundance. [Cf. *For. Abstr.* 8 (No. 2134).]

[764]. 45.3 : 12.26–8 : 13.2 : 41. STEWART, K. E. **Investigations on the chemical control of the native Elm bark-beetle *Hylurgopinus rufipes* Eichh.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 3 (6), 1947 (2–4).

The Dominion Division of Entomology is investigating the use of contact sprays of long-lasting residual qualities in order: (1) to prevent entrance into and inoculation of healthy trees by adult beetles newly emerged from diseased material; (2) to prevent the breeding of adult beetles infesting trees and logs; and (3) to kill the beetles as they emerge from infested material [cf. *For. Abstr.* 8 (No. 1458)]. Investigations during 1947 were confined mainly to laboratory tests on on the residual effects of DDT sprays in the form of emulsions and suspensions applied to living trees. Velsicol AR53A, xylene, and one of the aromatic petroleum-oil series were used as solvents for DDT. Atlox 1045A and Triton X 155 were employed as emulsifying agents. In two of the emulsion series, Mentor oil No. 29 was added, to determine if weathering and surface film qualities might be improved. A commercial, 50% wettable DDT powder was employed in making the suspension sprays. The tests were made at concentrations of 16, 8, 4, 2, 1, and ½ lb. of DDT per 100 gal. when sprayed branches were placed in cages with 20–25 newly emerged adult beetles. At all concentrations, adults failed to enter the inner bark, while entries in control material were 61–77%. There were slight differences in the rates of mortality from the sprays, those containing the Velsicol being in all cases more rapid in action. The addition of oils to the sprays did not increase their effectiveness. Complete kills were effected by the 1-lb. and ½-lb. concentrations, but they took longer than the stronger ones. When heavily infested logs were sprayed, no appreciable effect on the larvae or pupae in the logs ensued, but 77–87% of adults died soon after emergence, and almost 100% within 5 days. Sections of Elm trees sprayed by a hydraulic sprayer at 775 lb. pressure with DDT emulsions at concentrations of 16, 18, and 4 lb. were placed, 5 weeks later, in rearing cages with recently emerged adults; in less than 3 hours most of the beetles were dying. Large-scale spraying operations were undertaken in the field during the period of emergence in August, but results are not yet available.

47. INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

[765]. 47 : 12.25 : 11.41 : 44.3. [DAY, W. R.] **Root disease and butt-rot of conifers.** *Rep. imp. For. Inst., Oxf. 1946–7*, 1948 (9).

Examination of the root systems of a number of wind-thrown trees in Bagley Wood, growing on ground with an imperfectly drained subsoil, showed that dead secondary roots were frequent wherever waterlogging occurred for long periods, and also occurred, though less frequently, in upper soil layers which on occasion suffer severely from drought. Isolation of possible parasites was attempted from areas of dead bark which occurred on these root systems at places where there was no mechanical injury and where it was plain that death had been recent. In only 3 out of 36 trials was a root-decay or butt-rot pathogen isolated, which appears to show that the early stages of root disease are not necessarily produced by the fungi that are later found on the diseased root system or causing butt rot in the stem. Further evidence was obtained from a young Douglas Fir plantation in Shropshire infected with *Fomes annosus*; the root systems of these trees showed clearly that a partial dying of the roots had taken place owing to non-parasitic factors and that a recovery had followed, which was quickly succeeded by infection. These observations support the conclusion already reached, that the physical make-up of the soil, including the water/air regime prevailing within it, usually provides the fundamental conditions for the infections that accompany the dying of roots and result in the development of butt rot. [Cf. *For. Abstr.* 10 (No. 696).]

[766]. 47 : 12.26–8 : 13.2 (421–8) : 45.3. ALLEN, A. A. **Invasion of a locality by *Galerucella calmariensis* L. (Col., Chrysomelidae).** *Ent. mon. Mag.* 84 (1005), 1948 (46).

A disease of Alder in part of south-west Essex, first noted in the summer of 1946, caused light brown mottled patches to form which tended to spread and coalesce, ultimately killing much of the leaf and giving badly affected trees a prematurely withered appearance. The outbreak coincided with an unusual attack by *Galerucella calmariensis*, and as the patches originated mostly from the holes made by the insects, it is concluded that the disease is due to a fungus or virus infection carried or spread by the insect.

[767]. 47 : 12.26–8 (45). MEZZETTI, A. Notizie su di una nuova malattia del kaki diffusa in Italia. [**A new disease of *Diospyros kaki* widespread in Italy.**] *Ann. Sper. agr.* (*n.s.*) 1 (3), 1947 (425–430). [It.it.e.]

[768]. 47 : 12.26–8 (45). GOIDÀNICH, G. Deperimenti e mortalità dei peschi in rapporto a necrosi del floema e degenerazione del cambio nella Venezia Giulia. [**Die-back and mortality of Peach trees accompanied by phloem necrosis and degeneration of the cambium in Venezia Giulia.**] *Ann. Sper. agr.* (*n.s.*) 1 (3), 1947 (395–424). 27 refs. [It.it.e.]

[769]. 47 : 12.26–8 (791) : 42.23. **Plantings of Tamarisk trees for saw logs.** *Rep. Ariz. agric. Exp. Sta. 1946*, 1947 (20–1).

Cuttings of *Tamarix aphylla* planted in 1942 grew rapidly for two seasons; a pathological or nutritional condition then occurred which considerably retarded growth. The cause of this condition has not been determined. It may be due to several factors, including over-close spacing and lack of soil moisture. A complicating factor is sunburn on the south side of trunks, which causes excentric growth.

5. MENSURATION. INCREMENT. YIELD

See also *For. Abstr.* 10 (No. 347).

52. MEASUREMENT OF TREES AND TIMBER

52.1. *Diameter*

[770]. 52.1 : 07.7 : 12.29. TIWARI, S. D. N. **A new calliper for measuring diameters of standing Bamboo culms.** *Indian For.* 73 (11), 1947 (488–9). 6 refs. [Indian Forest College, Dehra Dun.]

An experimental (wooden) calliper made at the F.R.I., Dehra Dun, has the 2 arms moved by a pair of sliding handles, with a scale at the distal end reading zero when the arms are touching. With handles 4 ft. long, all culms in clumps up to 7 ft. diam. can be measured

correctly down to $\frac{1}{20}$ in. The calliper is simple to construct and the design of the clamps holding the sliding, beaded handle allows errors due to wear and tear to be readily corrected.

52.2. *Height. Length*

See also *For. Abstr.* 10 (No. 801).

[771]. 52.2 : 56.01. DOMES, N. Graphische Interpolation von Bestandeshöhenkurven aus wenigstens 4 gegebenen Fixpunkten. **[Graphical interpolation of stand height curves from at least 4 given fixed points.]** *Allg. Forst- u. Holzw. Ztg.* 58 (17/18), 1947 (143–4). 6 refs. [G.]

52.3. *Form. Taper*

[772]. 52.3 : 12.26–8 : 52.43.3. MACDONALD, J. **Taper and volume tables for Ash.** *Quart. J. For.* 42 (2), 1948 (85–9).

Tentative tables for Ash, based on about 400 measurements for taper and 944 measurements for volume.

52.4. *Measurement of Volume*

See also *For. Abstr.* 10 (Nos. 524–5, 772).

[773]. 52.4. GROSENBAUGH, L. R. **Improved cubic volume computation.** *J. For.* 46 (4), 1948 (299–301).

Explains a method of computing cubic volume of trees by a simplified version of Newton's prismatoidal formula. This gives much greater accuracy than Huber's or Smalian's formulae, which are generally used for the purpose.

[774]. 52.43.2 : 51. GEVORKIANTZ, S. R. **Converting volumes between International ¼-inch rule and Scribner rule.** *Tech. Notes Lake St. For. Exp. Sta.* No. 283, 1947. p. 1.

Includes a table of reducing factors for trees from 10 to 40 in. d.b.h. by 2-in. classes, containing $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$ and 4 sixteen-ft. logs respectively.

[775]. 52.43.2 : 51. GEVORKIANTZ, S. R. **Converting volumes between International ¼-inch rule and the Doyle rule.** *Tech. Notes Lake St. For. Exp. Sta.* No. 287, 1948. p. 1.

[776]. 52.43.2. CALDER, W. W. **Chart for measuring timber.** *Ill. Carp. Build.* No. 3672, 1948 (64). P.R.

Illustrates and describes the use of a chart for calculating the number of cu. ft. in any batten, deal or plank whose length is from 6 to 20 ft.

[777]. 52.43.3 : 12.25 : 12.26–8 (471). ILVESSALO, Y. Pystypuiden kuutioimistaulukot. **[Volume tables for standing trees.]** *Commun. Inst. for. Fenn.* 34 (4), 1947 (1–149). 12 refs. [Fi.e.]

Provisional volume tables are presented for Scots Pine, Norway Spruce, Birch and Aspen in Finland, with a full account of their preparation, use, and accuracy so far as tested to date. The factors used are d.b.h., height and form—the last-named as a taper index (difference between d.b.h. and a diameter at reasonable height, viz. 6 m. for trees 8 m. or more high, and 3·5 m. for those 6–7 m. high). The difficulties in determining form class and form height as used in Tor Jonson's tables, the only general tables so far available in Finland, are eliminated. Table headings, etc., are translated into English.

[778]. 52.43.3 : 12.26–8 (769) : 57.9. GUSTAFSON, R. O., and HORNBECK, B. L. **Tree volumes and timber yields in the Breathitt area of Eastern Kentucky.** *Bull. Ky. agric. Exp. Sta.* No. 494, 1946. pp. 20.

[779]. 52.43.3 : 12.26–8. GRIFFITH, A. L., RAM, B. S., and PRASAD, J. **General standard and commercial volume tables for *Terminalia tomentosa*, W. and A.** *Indian For. Rec.* (*n.s.*) *Silviculture* 4–A (5), 1947. pp. iii + 305.

[780]. 52.43.3 : 12.26–8 (45) : 57.9. [GIORDANO, G.] Tavole dendrometriche e cormometriche per il faggio cresciuto in fustaia di tipo coetaneo (Foresta di Gargano). **[Volume and yield tables for Beech grown in even-aged high forest stands (Forest of Gargano).]** *Ital. for. mont.* 3 (1), 1948 (58–60). [It.]

[781]. 52.43.5. WANNER, J. Die Schnellkreisprobefläche. **[The rapid circular-sample-plot [method].]** *Allg. Forst- u. Holzw. Ztg.* 57 (9), 1946 (68–70). [G.]

Briefly describes the method and procedure, including the use of a mirror instrument for setting out the plots [cf. *For. Abstr.* 9 (No. 622)].

A note is appended on the use of the instrument as an aid in the field determination of the form factor.

[782]. 52.43.6. Wood, L. S. **Estimating the unknown.** *Quart. J. For.* 42 (2), 1948 (103–6).

Describes a method of evaluating from the stumps the volume of timber removed from a stand.

[783]. 52.43.4 : 07.7. Harrison-Smith, J. L. **The planimeter for computing sample tree volumes.** *N.Z. J. For.* 5 (4), 1947 (325–6).

Describes briefly the use of the planimeter in sample tree volume calculations and increment studies.

52.46. Strip Surveys

[784]. 52.46 (542). Sahai, R. **Partial enumeration in the Dehra Dun forest division.** *Indian For.* 73 (10), 1947 (437–44).

Describes in detail the method of partial enumeration by systematic parallel strips, 2 chains wide, employed by the working plan party, Dehra Dun forest division, 1946–47, following the ascertainment by the silviculturist of the efficiency of partial enumerations [cf. *For. Abstr.* 8 (No. 2151)]. There are two appendices, one giving detailed instructions to enumerators and the other suggesting symbols for use on the map to show the results of enumerations. *From author's summary.*

[785]. 52.46 (728.5). Shank, P. **Notes on a timber survey in Eastern Nicaragua.** *Trop. Woods* No. 93, 1948 (48–53).

The results of a cruise made by the strip method are given in a table and methods discussed. The table includes: (1) number of merchantable stems per ha., (2) bd. ft. volume per ha., (3) bd. ft. volume of the average tree, all by species.

53. SOLID CONTENTS OF STACKED MATERIALS

[786]. 53 : 33.02 : 12.25. Eklund, B. Undersökningar över fastmasseprocenter, åtgångstal m.m. vid mätning av 2- och 3-meters tall- och granmassaved. **[Investigations on solid volume per cent in stacked 2- and 3-m. Scots Pine and Norway Spruce pulpwood and the solid volume over bark required to make 1 stacked cu.m. of barked, seasoned pulpwood.]** *Medd. Skogsforsknlnst., Stockh.* 37 (1), 1948 (1–42). 7 refs. [Sw.e.]

[787]. 53 : 33.38.1. Benassi, L. Cubatura e rendimento delle carbonaie. **[Volume and yield of wood stacked in circular piles for the purpose of charcoal burning.]** *Ital. for. mont.* 3 (1), 1948 (55–7). [It.]

Shows how to calculate the volume of a circular, dome-shaped pile of wood stacked ready for charcoal burning. A table gives values in cu.m. for stacks of different circumferences and heights. Charcoal yield % of stacked volume is given for Oaks, Beech, *Pinus pinaster* and *P. sylvestris*, Silver Fir and Spruce.

54. FACTORS CONNECTED WITH ASSORTMENT

[788]. 54 : 01.2 (436). Güde, J. Derbholz. **[The term 'Derbholz'.]** *Allg. Forst- u. Holzw. Ztg.* 58 (9/10), 1947 (75–8). [G.]

It is argued that developments in the uses of small wood have stultified the traditional definition of *Derbholz* as timber down to 7 cm. diameter over bark. The following is suggested as a simple definition in accordance with the times: 'Derbholz is all wood down to 4 cm. diameter under bark in the case of hardwoods, and all stemwood in that of conifers'. The case for such a definition is examined in detail.

55. AGE

[789]. 55 : 12.25 : 21.63.3. Morris, R. F. **Age of Balsam Fir.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (1), 1948 (1).

Most Balsam Fir stands on Green River show a variable initial suppression period in radial growth at the base of the trees. This sometimes exceeds 100 years and represents the advance-reproduction period during which the tree made little gain in size. It is important to know whether this period should be included in determining the true physiological age of the tree, or whether that age should be reckoned from the date of initial release. Preliminary reports on a special study undertaken in 1947 indicate that physiological age, as evidenced by sexual maturity, decadence, and rate of growth

at maturity, is independent of the initial suppression period.

56. INCREMENT

See also *For. Abstr.* 10
(Nos. 134, 138, 158, 167, 218, 241–2, 771).

[790]. 56 : 12.25 (411–4). HUNTER BLAIR, SIR J. **The Polish Larch (*Larix decidua* var. *polonica*, Ostenfeld: *Larix polonica* Raciborski).** *Scot. For.* 1 (3/4), 1948 (21–5). 5 refs.

A review of the available data on Polish Larch, both on the continent and in Great Britain. The author describes a plot on his own estate in Ayrshire, sown with seed of this Larch, of Polish provenance, in 1931, which now has an average height of 25 ft. and q.g.b.h. 3 in. under bark, and is perfectly vigorous and free from disease, whereas neighbouring plantations of ordinary European and Japanese Larch of similar age and on similar sites have been almost destroyed by die-back, probably as a result of the severe late frost of 1945. Specimen trees at Bedgebury, Kent, grown from seed sown in 1925, are now 55 ft. high and have a q.g.b.h. 9 in. under bark. It is concluded that this Larch should be given an extended trial in Great Britain, with seed collected from various districts of Poland.

[791]. 56.02 : 11.21 (471). BRIER, G. W. **Northern hemisphere surface pressure and climatic fluctuations and vegetation growth in Northern Finland.** *Nature, Lond.* 161 (4097), 1948 (730–1). 4 refs.

The author presents a curve showing the departures from normal of mean annual pressure in the northern hemisphere for the period 1899–1939, which is practically a reversal of the curve presented in a recent article by Hustich [see *For. Abstr.* 9 (No. 1939)] showing the correlation between tree growth and increasing summer temperature in Northern Finland during the same period. The multiple correlation coefficient between tree growth and these two climatic factors is 0·68, which indicates that nearly half the variation in annual tree growth is accounted for by the regression on local summer temperature and the mean annual pressure for the hemisphere.

[792]. 56.04 : 04.3 : 56.1. KEMP, P. D., and METCALF, M. E. **Tables for approximating volume growth of individual trees.** *Sta. Pap. Nth. Rocky Mt. For. Range Exp. Sta.* No. 11, 1948. pp. 14.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 10
(Nos. 147, 167, 778, 780, 813).

[793]. 57 : 01.7 : 56 : 12.25 (46). AGUADO SMOLINSKI, J. Un caso de aplicación de la estadística matemática a la producción forestal. **[An example of the application of mathematical statistics to forest yield.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 18 (35), 1947. pp. 55. [Span.]

The application of statistical methods to forestry is illustrated by an analysis of mensurational data from a sample plot of *Pinus radiata*. A study of statistical frequencies and deviations in diameter and height increment values gives valuable information on the evolution of the stand, its homogeneity, the relationship between height and diameter increment and the effects of thinnings.

[794]. 57 : 12.26–8 (439). FEKETE, Z. Fatermési és faállományszerkezeti vizsgálatok a hazai tölgyesekben. **[Investigations on yield and structure of the Hungarian Oak forests.]** *Erdész. Kisérl.* 46, 1945–6 (1–155). Many refs. [Hu.g.]

(1) Provisional yield tables are presented separately for high-forest and coppice stands of Oak (mainly Pedunculate Oak) in Hungary, and the difficulties encountered in their preparation —due largely to wide variations in silvicultural treatment—are discussed. Six quality classes are recognized for high forest, and 9 for coppice, assessed by mean height of dominants. A table and graph are included for converting crown density to crop density by volume.

(2) Questions relating to the structure of even-aged Oak stands are examined with the aid of data obtained for (1). Changes with age in the representation of the various crown classes are considered, and an analysis is made of age, diameter, height and volume relationships. For the latter purpose the original data are recalculated so that per-mille values are obtained for any given 'relative diameter' [= actual diam./mean stand diam., expressed as a decimal fraction of the latter]. Frequency curves and tables are then constructed for the several factors, as well as 'summation tables'

which indicate the sum (in per mille) of the number of stems, or of the timber volume, up to any desired 'relative diameter'. The remainder of the paper deals with the mean tree, its percentage frequency and differences arising when mean volume, mean basal area or mean diameter are taken as the basis of selection, and with the use of mean-height curves in the determination of stand volume. [See *For. Abstr.* 8 (Nos. 1465–6).]

[795]. 57.6 : 22.88.1 : 12.25. BROWN, J. P. **A study of mortality in Douglas Fir/Larch stands of North Central Washington.** *Abstr.* of thesis, in *J. For.* 46 (5), 1948 (358).

Cruise data from 960 acres of virgin Larch/Douglas Fir type in the Colville National Forest were classified according to living and dead trees. Regression equations were developed to show the relation of living and dead timber in terms of number of trees, number of logs, volume, and basal area. The regression lines were significant and similar for these relationships. The amount of dead timber in the stands studied was about $\frac{1}{3}$ of the stand volume. Assuming that this dead timber represented mortality for the last 25 years, it seems that selection cuttings with cutting cycles of 25–30 years, should remove about $\frac{1}{3}$ of the stand volume. *From author's abstract.*

6. MANAGEMENT. WORKING PLANS. SURVEYS

See also *For. Abstr.* 10 (No. 809).

60. GENERAL LAND MANAGEMENT

60.3. *Management of Different Classes of Forest*

See also *For. Abstr.* 10 (Nos. 171–2).

[796]. 60.3 (73). ZOBEL, B. J. **Forestry on a military reservation.** *J. For.* 46 (3), 1948 (188–90).

The author describes the surveying of an area held by the army for military training and the preparation of a working plan, primarily for the production of sawlogs and pulpwood, and explains how the plan was affected by the exigencies of military training.

[797]. 60.31.2 (713) : 52 : 35. MARRITT, I. C. **The farm woodlot.** *Bull. Ont. Dep. Lds. For.* No. *R*2 (rev.), 1947. pp. 44.

A revision of the bulletin noticed in *For. Abstr.* 2 (255).

[798]. 60.31.2 (797) : 76.2. MOSHER, M. M. **The farm forestry situation in Western Washington.** *Northw. Sci.* 21 (3), 1947 (124–8). A.P.B.

A study was made of a number of farms in West Washington in order to obtain data on possible returns from farm forests. On the farms selected, an average of 53% of the land was forested and the study included both undercut and overcut woodlands. In the year of the study, cash sales of forest products average $492 per farm; value consumed at home $194.

61. SURVEYING. MAPPING

See also *For. Abstr.* 10 (No. 99).

[799]. 61.3 (492) : 67. TROMP, P. H. M. Het belang van de boschinventarisatie en boschbedrijfsplannen voor den staat en voor den particulieren boschbezitter. **[The importance to the state and the individual forest owner of surveys and working plans.]** *Tijdschrift der Nederlandsche Heidemaatschappij* 57, 1946 (145–7). [Du.] H.S.B.

[800]. 61.32 : 07.7. WENGERD, S. A. **Newer techniques in aerial surveying.** *World Oil* 127 (3–6; 8), 1947 (37–40, 42; 46–8, 50, 54; 49–50, 52–4; 136–8, 140, 142; 131–2, 134, 136, 140). 111 refs. L.S.

Describes advances in photogrammetric processes, cameras, laboratory developing and printing; also in field control methods and geological interpretation of aerial photographs.

[801]. 61.32 : 52.2. ROGERS, E. J. **Estimating tree heights from shadows on vertical aerial photographs.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 12, 1947. pp. 16. 3 refs.

Practical hints on the use of the shadow technique based on the Station's experience in applying it to forest surveying in the Northeast. Present information shows that experienced persons can twice out of 3 times, estimate tree heights within 7 feet at photo scales of 1 : 20,000.

[802]. 61.4 : 32. L'ECUYER, L. P. **New method of showing the cut-over areas.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 957 (B–5), 1948. pp. 3 + 1 dgm.

The author has invented a method of showing cut-over areas by concentric rings centred on the camp from which the operation was conducted. The boundaries of cuts made each season from each camp, can thereby be seen at a glance. Different years' cuts are indicated by different broken, dotted etc. lines. The rings are spaced 2½ chains apart, with heavier lines every 20 chains, thus indicating clearly how far from a camp the operations were carried on. Areas of water, swamps, roads or waste land are not crossed by the lines. There is no possibility of confusion as to the camp from which each area or patch was cut, as a circle has only one centre.

62. COMMUNICATIONS

[803]. 62 (494) : 38.3 : 76. SCHILD, W. Generelles Wegnetz der Montozwaldungen. **[General road system for the Montoz forests [Swiss Jura].]** *Schweiz. Z. Forstw.* 98 (12), 1947 (439–50). 4 refs. [G.f.]

Details of newly projected roads, their planning, and estimated costs and returns.

63. ROTATION

[804]. PATRONE, G. Turno finanziario, turno economico e turno fisiocratico. **[Financial rotation, rotation of the highest income, and rotation of maximum volume production.]** *Ital. for. mont.* 3 (1), 1948 (46–50). [It.it.]

It is shown that the financial rotation is determined from the point of intersection of the curve of the rate of value increment of the stand with the curve of decrease of the coefficient of capital value of periodic yields, and that the rotation of the highest income is longer than the financial rotation or the rotation of maximum volume production. *From author's abstract.*

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

[805]. 64 : 01.4 : 11.4. GRIFFITH, A. L., and GUPTA, R. S. **The recording of soil and site characteristics.** *Indian For. Bull.* (*n.s.*) No. 145, 1947. pp. 14.

This bulletin records methods of recording the characteristics of a site, the description of soil profiles, and the collection of soil samples, giving details of all the points which should be noted. The methods are the result of many years of practical experience in the examination of a number of soils. They have purposely been kept as simple as possible so that they should be clearly understandable to rangers or intelligent foresters, who are usually the men who have to carry out a great deal of field work. *Authors' abstract.*

[806]. 64. SHARKEY, M. **The unreliability of tree growth in site assessment.** *Irish For.* 4 (2), 1948 (59–62).

The author stresses the unreliability of existing poor-quality timber stands as site indicators without due reference to the history of the stands, and cites two instances, In one case a thin stand of very poor, stunted Larch was found to be due to carelessly planted culls from another area, which had been given no subsequent attention, and in the other, a similar poor stand of Silver Fir was found to be the residuum of ill-grown misshapen trees left when all the better ones were removed during the first world war.

66. POSSIBILITY. SUSTAINED YIELD. YIELD REGULATION

[807]. 66 (494) : 65 : 98.1 : 2 : 12.19.2 : 09.4. LOCHER, A. Versuch einer Schätzung der Produktionsfähigkeit des Schweizer Waldareals bei natürlicher Bestockung. **[An attempt to estimate the yield capacity, if the growing stock were natural, of the forest area of Switzerland.]** *Schweiz. Z. Forstw.* 99 (1), 1948 (55–68). [G.g.f.]

The annual yield capacity of Switzerland's forest area, if the specific composition of the forests were in conformity with natural conditions, and given proper stocking, is estimated as at least 5·6 million cu.m., which is about 70% higher than the fellings of a normal year, e.g. 1938. This yield would cover domestic demands even in emergency conditions. Production of coniferous timber, however, would not meet the domestic consumption of this type of wood, but a proportion of 25% of conifers in the mixed hardwood region and 60% in the Beech/Silver Fir zone would be ecologically permissible and would cover requirements.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

[808]. 7 : 02.1. CHAPMAN, H. H., and MEYER, W. H. **Forest valuation: with special emphasis on basic economic principles.** McGraw-Hill Book Co., Inc. 1947. pp. xii + 522. 390 refs.

Contains the following chapters: (1) Some basic principles of economics which control forestry enterprises. (2) Private enterprise. The business unit. Capital. (3) The sources and origin of economic values. (4) Market values of forest property. (5) The law of diminishing returns and the marginal tree. (6) The evaluation of services and benefits. Compound interest and discount. (7) The evaluation, by appraisals, of real property producing annual income. Sustained yield management. (8) Methods of appraisal of the present worth of forest property producing periodic but not annual income. (9) Costs of production versus profits in forest enterprises. (10 Rates earned and the profit margin. (11) Forest rent, soil 'rent' and the rotation. (12) Taxation of forest property. (13) The appraisal of damages. (14) Forest fire insurance. (15) Method of appraisal of stumpage values. (16) Application of methods of stumpage appraisal. (17) Determination and application of conversion returns. (18) The appraisal of forest property to be purchased for future operation.

[809]. 7 : 02.1 : 74 : 6. GRØN, A. H. Bidrag til Skovøkonomiens Teori. Bind II: Skovbrugets Driftsøkonomi. 2 Afsnit: Skovvurdering. 3 Afsnit: Skovbrugets Driftsregistrering og -budgettering. **[Contributions to the theory of forest economics. Vol. II: The business economics of forestry. Sect. 2: Forest valuation. Sect. 3: Forest management.]** Den Kgl. Veterinær- og Landbohøjskoles Skovbrugsafdeling. Obtainable from G. E. C. Gads Forlag, Copenhagen. Sec. 2: 1944. pp. 258. 36 refs. Sect. 3: 1945. pp. 343. 105 refs. [Dan.]

Grøn's use of the term 'forest economics' is a comprehensive one. Previous works in this series have dealt with the general theory of forest economics [Vol. I, 1931] and the theory of the business economics of forestry [Vol. II, Sect. 1, 1943]. Besides the present sections on valuation and management, a future section will deal with book-keeping and accountancy in forestry.

The section on forest valuation contains chapters on : (1) categories of values (cost, replacement, capital, expectation and realization values), and on valuation (2) according to capital value, (3) according to expectation value, (4) according to realization value, (5) in cases of expropriation and (6) of damage by fire, storms, diseases, pests, etc. An appendix gives tables of 'expectation volume factors' [cf. *For. Abstr.* 8 (No. 1504)] for Beech and Norway Spruce, by age classes and for different rotations, at 4·0 and 4·5% interest; and, for Norway Spruce only, factors for determining planting costs prolonged at the same rates of interest, arranged by age classes and rotations.

The section on forest management [literally 'recording and budgetting (planning)', but approximately equivalent to 'management' in the strict sense] has chapters on (1) the purpose and scope of this subject; (2) and (3) historical development in general and in Denmark; (4) general description of the area to be managed (ownership conditions, rights, burdens, administrative features, insurance, labour conditions, marketing, natural (ecological) conditions, and history); (5) special description of the area (mapping, division and demarcation of the area and its parts, description of compartments, measurement of growing stock, age-class tables, etc.); (6) technical calculations concerning future management; (7) proposals regarding possible changes in business organization of the enterprise; and (8) economic calculations concerning future management.

73. RATE OF INTEREST

[810]. 73. HILEY, W. E. **The place of compound interest in forest finance.** *Forestry* 21 (2), 1947 (137–40, 231).

In reply to an article by W. L. Taylor [see *For. Abstr.* 9 (No. 650)] the writer takes 2 examples to show that compound interest is the most rational basis for working out financial returns from forestry. He agrees that money profits are not the only things to be considered in forestry, but the compound-interest principle, as applied to financial calculations, remains the same. In a counter-reply W. L. Taylor argues that changes in rates of interest and timber prices tend to make calculations at compound interest meaningless in such a long-term enterprise as forestry.

74. VALUE OF THE STAND. VALUE OF THE FOREST

[811]. 74 (481). LANGSÆTER, A. Skogens forrentningsverdi og venteverdi; overskudd og underskudd av hogstmodent virke. **[The rental value and expectation value of forest; surplus and deficit of exploitable timber.]** *Medd. norske Skogforsøksv.* 9 (4) (No. 34), 1947 (481–501). [Nor.]

The use of tables published in an earlier paper [see *For. Abstr.* 8 (No. 1505)] is illustrated by calculations of expectation values for normal Norway Spruce stands of various quality classes, with various rotations, costs and rates of interest. A comparison is made of the values arrived at by this method and those obtained by capitalizing the value of the current annual increment, as prescribed by the Norwegian tax authority for forest valuation [cf. *For. Abstr.* 9 (No. 2662)], and that authority's rules regarding so-called surplus or deficit of exploitable timber are discussed.

76. MANAGEMENT STATISTICS

See also *For. Abstr.* 10 (Nos. 165, 167, 190–1, 196, 208, 218, 241, 308–9, 326, 597, 798, 803, 843).

[812]. 76 : 12.25 (46) : 23.2 : 12.26–8. ORTEGA ERGUETA, M. Importancia de la forestación como fuente de ingresos para la economía de un país. **[Importance of reforestation as a source of income in a nation's economy.]** *Maderil, B. Aires* 20 (235–6), 1948 (21–2; 21–2). [Span.]

A comparison of costs and income in reforestation with *Pinus radiata, P. pinaster, P. sylvestris* and *Eucalyptus globulus*. Examples are based on figures from Spain.

[813]. 76 : 12.25 (931) : 57. SKIPWORTH, M. R. **Returns from clear felling an area of Insignis Pine.** *N.Z. J. For.* 5 (4), 1947 (327–8).

Enumerates volume of timber and profits from clear felling 7·8 acres of *Pinus radiata* planted in 1914 by the Dunedin City Corporation at 4-ft. spacing, on poor soil overlying hard yellow clay. Pruning was carried out in 1926; light thinnings in 1931 and 1936. The final yield was 685,018 bd. ft. log scale, equivalent to 87,820 bd. ft. per acre, plus 209 cords, or 26 cords per acre, of fuel.

[814]. 76 : 12.25 (942) : 23.3 : 63 : 35. BEDNALL, [B. H.]. **Current S.A. forest problems.** *Aust. Timb. J.* 14 (1), 1948 (49, 51, 53, 67–8).

A review of the financial aspects of the South Australian forest situation. Unlike the other states, South Australia has limited natural forests and extensive afforestation (mainly with *Pinus radiata*) has had to be done. Necessary experiments resulted in some financial losses in the past. The present average rotation of 26 years is considered very short for clear felling but has been dictated by urgent national demands for flooring and crate timbers. If a likely future demand for larger dimensions is to be met, the rotation will have to be increased to 40–50 years or even more. Prices and possible competition from imported timbers and from substitute materials are also discussed.

[815]. 76 : 12.25 (944) : 21.0 : 22.89. BLACK, R. M. **The history of the *Pinus* plantations in New South Wales.** *N.S.W. For. Rec.* 1 (1), 1948 (30–7 + 2 photos).

A short account of the various plantations, their silvicultural and yield characteristics and their post-war economic potentialities. A financial analysis is given for an acre of *Pinus radiata* plantation on a high-quality site, based on costs and returns at present rates. It is concluded that *P. radiata* can be grown profitably for box shooks and to supplement the supply of building timber, plywood etc., and that a considerable expansion of planting is justified.

8. FOREST ADMINISTRATION

[816]. 8. TWINN, C. R. **Insect repellents.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Can.* 4 (2), 1948 (3).

Summarizes recent developments in repellents to protect men from the attacks of biting insects.

81. ORGANIZATION

[817]. 81 (431–5). RYLE, G. B. **The German forest service (Forst und Holzwirtschaft).** *Quart. J. For.* 42 (1), 1948 (19–22).

82. LABOUR QUESTIONS

See also *For. Abstr.* 10 (Nos. 238, 347, 640, 845).

[818]. 82 (485). HYRENIUS, H. Statistisk-ekonomiska studier rörande det svenska jordbruket. **[Statistical and economic studies on Swedish agriculture.]** *K. Lantbr. Akad. Tidskr., Stockh.* 86 (5/6), 1947. pp. 500. 50 refs. [Sw.e.] E.M.B.

Contains a short section (pp. 444–7) on forest labour needs. Formulae are given for calculating consumption of labour in different parts of the country, expressed in man-hours per hectare of forest.

9. FOREST POLICY

[819]. 2. GRØN, A. H. **The economic foundations of forest politics.** *Unasylva* 1 (3), 1947 (3–6).

90. GENERAL PRINCIPLES OF FOREST POLICY

See also *For. Abstr.* 10 (Nos. 9, 848).

[820]. 90 (45 : 458) : 2 : 12.19.2. PHILIPPIS, A. DE. La selvicoltura della montagna appenninica ed insulare. **[Forestry in the mountainous areas of the Apennines and the Italian islands.]** *Repr.* from *Atti del Congresso della Montagna e del Bosco* 1947 (169–89). [It.]

Describes the various forest types in the Apennines and the mountainous parts of Sicily and Sardinia, discusses problems of reforestation and the competing claims of agriculture, pastoral industry and forestry, and suggests general lines of policy.

[821]. 90 (46) : 35. MARTINEZ HERMOSILLA, P. Notas para una 'Política Nacional de Montes'. El aislarse de la industria no es solución. **[Notes on a 'national forest policy'. Isolation of the industry is not a solution.]** *Montes, Madrid* 3 (18), 1947 (563–6). [Span.]

A plea for a unified policy for forestry and forest products industries in Spain. [Cf. *For. Abstr.* 9 (No. 2499).]

[822]. 90 (71) : 07.2. ELLIOTT, G. R. **Forestry and forest research.** *Timber of Canada* 8 (9), 1948 (34–5, 92, 95–6, 99).

A brief history of the growth of forest conservation practices in Canada and of the development of research and scientific knowledge in this sphere.

[823]. 90 (729.7). GUICHON, A. Le domaine forestier de la Guadeloupe. **[The forest resource of Guadeloupe.]** *Rev. int. Bois* 15 (127), 1948 (6–8). [F.]

[824]. 90 (73) : 09.1. PINCHOT, G. **Breaking new ground.** Harcourt, Brace and Co., New York. 1947. pp. xvii + 522 + 32 plates. Price $5.00.

An autobiographical account of the development of the Forest and Conservation services in the U.S.A.

91. SOCIAL AND ECONOMIC INFLUENCE OF THE FOREST. NATIONAL PARKS. RESERVES. FOREST INFLUENCES

See also *For. Abstr.* 10 (Nos. 9, 27, 324).

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

[825]. 91.1 : 06.2. **International Conference for the Protection of Nature (Brunnen, June 28th–July 3rd 1947): proceedings, resolutions and reports.** Provisional International Union for the Protection of Nature, Basle. 1947. pp. 286 + plates + maps. [F.E.]

[826]. 91.1 (410). **Conservation of nature in England and Wales. Report of the Wild Life Conservation Special Committee (England and Wales).** H.M. Stationery Office, London. *Cmd.* 7122, 1947. pp. v + 139 + 2 maps. [Ministry of Town and Country Planning.]

[827]. 91.1 (410). **Report of the National Parks Committee (England and Wales).** H.M. Stationery Office, London. *Cmd.* 7121, 1947. pp. v + 134 + 13 maps. [Ministry of Town and Country Planning.]

[828]. 91.1 (410). **Hatfield Forest.** The National Trust. 1946. pp. 17 + plates. Price 1*s*.

[829]. 91.1 (410). **Wicken Fen.** The National Trust. 1947. pp. 32 + plates and maps. Price 2*s*.

[830]. 91.1 (421–8). **Protection of the New Forest. Planning Officers' Report: Technical Committee's Revision.** New Forest Advisory Planning Committee, Lyndhurst. 1945. pp. 40 + 1 dgm.

Cf. *For. Abstr.* 10 (No. 842).

[831]. 91.1 (429). **National Forest Park Guides: Snowdonia.** H.M. Forestry Commission. 1948. pp. 72.

[832]. 91.1 (73) : 13.15. KING, R. T. **The future of wildlife in forest land use.** *J. For.* 46 (4), 1948 (282–9).

[833]. 91.1 (81). Parques florestais. [**Brief descriptions of seven of the most important Brazilian forest reserves.**] *Brasil madeireiro* 3 (29), 1947 (26–31). [Port.]

[834]. 91.1 : 13.15 : 47. DALKE, P. D. **Some observations on den trees in the Missouri Ozarks.** *J. Wildlife Mgmt.* 12 (1), 1948 (107–9). 5 refs. [Missouri Cooperative Wildlife Unit, Columbia.] B.A.P.

Data on 7 species of 'den' tree (i.e. trees having hollows at ground level or holes in limbs or trunks) are presented. Among the species studied (*Quercus* spp., *Nyssa sylvatica*, *Carya* spp. and *Pinus echinata*) ratios of den trees to sound varied from 1 : 3 for *Q. velutina* to 1 : 12 for *Q. coccinea*.

91.3. *Influence of the Forest on the Environment*

See also *For. Abstr.* 10 (Nos. 50, 59–60, 177).

[835]. 91.3 : 11.6. KITTREDGE, J. **Forest influences: The effects of woody vegetation on climate, water, and soil, with applications to the conservation of water and the control of floods and erosion.** McGraw-Hill Book Co., Inc., New York. 1948. pp. x + 394. 381 refs. Price $4.50 (27*s*.).

91.4. *The Forest in Hygiene and Recreation*

[836]. 91.4 (73). CHAPMAN, H. H. **Recreational interests as affecting professional forestry activities.** *J. For.* 46 (4), 1948 (290–3).

92. FOREST LAW

See also *For. Abstr.* 10 (No. 747).

[837]. 92 (410). **Forestry Act, 1947. 10 and 11 Geo. 6 Ch. 21.** H.M. Stationery Office, London. 1947. pp. 5. Price 2*d*.

[838]. 92 (676). **Uganda Protectorate: Forest Department handbook.** Govt. Printer, Entebbe. 1948. pp. 40 + 4 + [9].

[839]. 92 (711). HODGINS, H. J. **Basic features of B.C.'s new forest management law.** *W. Cst. Lumberm.* 75 (4), 1948 (128 *f–g*).

[840]. 92 (73) : 23.27. SIMONEAU, E. T. **The legal side of trees.** *Proc. 22nd nat. Shade Tree Conf.* 1946 (13–33).

A résumé of state and federal laws relating to shade trees in the U.S.A.

[841]. 92 (945) : 11.6. LAWRENCE, A. O. **New Soil Conservation Act in Victoria.** *Aust. For.* 11, 1947 (34–6).

94. FOREST OWNERSHIP

[842]. 94 (410). **Motion—The New Forest.** *Parliamentary Debates* (*Hansard*): *House of Lords off. Rep.* 154 (42), 1948 (103–30).

Cf. *For. Abstr.* 10 (No. 830).

[843]. 94 (45) : 97.2 : 76. BENASSI, L. I boschi a mezzadria. [**Working woodlands on a share-cropping system.**] *Ital. for. mont.* 3 (1), 1948 (11–20). [It.]

Describes a system of tenure common in parts of Italy, in which the tenant farmer, besides cultivating the farm, also provides the necessary labour for felling, trimming, and hauling timber (silvicultural operations are non-existent or negligible, the development of the final crop being left to nature), and shares the proceeds with the landowner. The author analyses the economic aspects of this system as observed on three typical estates, with areas of mixed hardwood coppice, worked on a 10-year rotation, under scattered standards. The silvicultural effects are unfortunate, the tenant

having little incentive to improve the woodland, e.g. by lengthening the rotation, increasing the reserved stand, cleaning etc., since he has no certainty of enjoying the fruits of his labour, though such measures are shown to be economically profitable to both parties.

[844]. 94.11 (471). HELANDER, B. Kronoskogshushållningen i Finland. **[State forest administration in Finland.]** *Papp. Trävarutidskr. Finl.* 30 (7A), 1948 (11–17). [Sw.] P.R.

A historical review of the development of Finnish State forest administration and policy.

[845]. 94.4 (91) : 82 : 09.7 : 12.25 : 21 : 31.0 : 34.26. DIJK, L. J. VAN. Landschapsbedrijven als middel tot opheffing van onontwikkelde streken in Nederlandsch-Indië. **[Compulsory communal enterprises as a means of improving undeveloped areas in the Netherlands Indies.]** N.Y. Gebr. Zomer and Keuning's Utgevers Mij, Wageningen. 1942. pp. 199 + 1 map. 286 refs. [Du.]

Reviews the historical development of the East Indies as a whole, discusses labour problems and suggests a framework for communal enterprises based on a proportion of compulsory labour. Describes the forest areas of the island of Japen and their commercial possibilities, the development of timber exploitation in the past and possibilities of improvement. Discusses in detail the cultivation of *Agathis* species for timber and resin, with special reference to the export trade.

[846]. 94.7 (45). SORBI, U. In tema di commassazione dei fondi rurali. **[The consolidation of rural holdings.]** *Ital. for. mont.* 3 (1), 1948 (27–40). 18 refs. [It.]

A statement of the desirability of consolidation of peasant holdings in Italy, particularly in the Alps, with some account of what has already been done in this respect in Switzerland. [Cf. *For. Abstr.* 7 (No. 2193).]

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 10 (Nos. 9, 96, 238, 843).

[847]. 97.1 (410). STAMP, L. D. **The land of Britain: its use and misuse.** Longmans, London. 1948. pp. viii + 508. 233 refs. Price 42*s*.

Summarizes the work and findings of the Land Utilization Survey of Britain, which was instituted in 1930 in order to discover the use to which every acre of Great Britain was being put. The author goes on to enunciate the general principles of land-use planning and their application.

[848]. 97.1 (543) : 90 : 86. HAMILTON, A. P. F. **Note on a tour of inspection in some of the forests of the Eastern States Agency.** Inspector General of Forests to the Govt. of India. 1947. pp. 32.

Notes on forests and forest policy in the states of Khairagarh, Kanker, Bastar, Kalahandi, Patna, Rairakhol, Bamra, Pal Lahara and Keonjhar. Particular attention is given to a number of successful experiments in the settlement of aboriginal tribes on permanently cultivable land and the subsequent reservation and restoration of forest areas in which they had formerly practised shifting cultivation. The factors found to be essential to success are: (1) tactful persuasion of the aboriginals, who must be made to understand that everything is being done in their own interests; (2) appointment of a special officer to carry out the work; (3) adoption of a general policy which shall subsequently undergo as little change as possible; (4) the colony must be near the hill in which the spirits of the ancestors dwell; (5) if possible, medical aid in the form of a dispensary; (6) the promise of ultimate title in the new land; (7) aid in the form of bullocks, grain, etc., construction of bunds, minor canals, etc.; (8) unrestricted right to roam the forests for roots, fruits, honey, etc., which have always formed an important part of the aboriginals' livelihood; (9) remission of rent for a short period on reclaimed land; (10) moneylenders, liquor sellers and other human parasites must be excluded from the settlements; (11) finally, and most important, legislation to prevent alienation of land.

[849]. 97.1 (676). WORTHINGTON, E. B. **A development plan for Uganda.** Govt. Press, Entebbe. 1947. pp. 112.

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References: 1. *Annales de Géographie*, Paris. 2. *British Columbia Lumberman*, Vancouver 3. *China News*, London. 4. *Crown Colonist*, London. 5. *East African Agricultural Journal*, Amani. 6. *F.A.O. Press Release*. 7. *Foreign Agriculture*, Washington. 8. *Foreign Commerce Weekly*, Washington. 9. *Forest Leaves*, Philadelphia. 10. *Forêt québecoise*, Quebec. 11. *Italia forestale e montana*, Florence. 12. *Lesnaya Promÿshlennost'*, Moscow. 13. *Maderil*, Buenos Aires. 14. *M.L.B. Log*, Amherst, N.S. 15. *Montes*, Madrid. 16. *New Zealand Journal of Agriculture*, Wellington, N.Z. 17. *New Zealand Journal of Forestry*, Palmerston North, N.Z. 18. *Skogen*, Stockholm. 19. *Southern Lumberman*, Nashville, Tenn. 20. *Southern Pulp and Paper Manufacturer*, Atlanta, Ga. 21. *Svenska Skogsvardsföreningens Tidskrift*, Stockholm. 22. *Timber of Canada*, Ottawa. 23. *Times*, London. 24. *U.N.O. leaflet*. 25. *West Coast Lumberman*, Seattle, Wash. 26. *Wood Products*, Chicago. 27. *Woodland World*, Montreal.

The numbers in brackets indicate the reference number and date of publication of the periodicals, etc., to which the annotations refer.

Conferences. The 7th International Congress of Agricultural Industries, called together by the French Government, was held in Paris, 12–18th, July, 1948. One group dealt with the wood, cellulose, and fibre textile industries.

The United Nations Scientific Conference on the Conservation and Utilization of Resources will be held in the United States in May–June, 1949. In its plenary meetings the Conference will examine the contribution of improved techniques to the alleviation of shortages of mineral resources, fuel and energy, food, and forest products, and a series of plenary meetings will be devoted to questions of particular importance to under-developed countries. The Conference will be scientific rather than policy-making. Technical developments will be selected for discussion according to their practical contribution, actual and potential, to economic development, and will be treated so as to interest the economist as well as scientist, administrator and engineer. Conference papers submitted by experts will be published after the Conference (**24**; 3.3.48).

A sub-committee on mechanical wood technology, which met at Geneva, 8–12th June, 1948, consisting of experts from various countries, recommended the standardization of the following wood tests:—compression parallel to the grain, static bending, impact bending (**6**; 14.6.48).

The conference held at Rome, 16th February, 1948, agreed to the suggestion of the Italian delegation that the seat of the European regional centre of the organization should be permanently established at Rome (**11**; March–April, 1948).

Belgian Congo. A plywood factory is under construction in Elisabethville, Belgian Congo. This plant will be the second largest plywood factory in Africa. In addition to supplying the entire plywood needs of the Congo, it will produce a surplus for export (**8**; 24.4.48).

Bolivia. The Bolivian Government has established certain controls over the exploitation of forest lands by a decree promulgated 23rd February, 1948. This stipulates that agriculturists must receive from their respective departmental prefects permission for cutting trees in order to clear the land for farming. Commercial firms exploiting the forests must receive authorization from the Ministry of Agriculture, which may refuse any such requests if incompatible with the public interest. This decree annuls a previous one of 29th November, 1946, which granted to owners of forest lands the right to exploit their forests without obtaining previous permission from the Government (**8**; 22.5.48).

Brazil. An intensive scheme of reforestation is being launched by the government of Rio de Janeiro State. In order to encourage planting, all land dedicated to reforestation is to be exempted from taxation (**13**; Feb. 1948).

British Honduras. Pine seedlings are raised at the Stann Creek Nursery in boxes placed on concrete floors (to protect the seed from ants) under sliding roofs (to protect seedlings from excessive heat). At 6–8 weeks they are moved into transplant beds (**4**; April 1948).

Pine is being cut in the Colony at a rate of about 250,000 cu. ft. of timber per year. Much is being converted by a portable sawmill which produces 180,000 bd. ft. per month (**4**; May 1948).

Canada. Difficulties in protecting New Brunswick forests from fire will be partly overcome this year by the introduction of a twin-engined aircraft capable of patrolling the great stretches of unbroken woodland in the northern part of the province. The plane will carry 4 passengers in addition to the pilot, and passenger seats are removable to allow of carrying freight. It will be equipped with a camera port and two-way radio equipment (**22**; April 1948).

A lumber company in Oxford County, Ontario, has just been fined $75 and ordered to pay costs for infringment of the Tree Conservation Act, 1947, the first prosecution under the Act. The company was charged with the offence of felling trees of less than 12 in. d.b.h. in contravention of the county regulations (**10**; May–June 1948).

A New Brunswick lumberman has given 50 acres of woodland to the regional high school of Harvey, N.B., for educational purposes. Older students at the school are to have the opportunity of learning woodlot management through actual experience in running lines, cruising, selecting trees, cutting, and felling. Revenue from these operations is to go into a fund for a scholarship to the student who contributes most to the management of the woodlot (**22**; June 1948).

A new type of band saw with a hard cutting edge which spirals round the band is said to be under manufacture by a Canadian firm. It is claimed that material can be cut in any direction without turning the work, since the spiral cutting edge is controlled by rubber roller guides providing for a 360° turn. The hardened-tooth spiral permits the cutting of intricate dies and the filing of small radii in openings inaccessible to the ordinary bench file or needle file equipment. Wood, plastics, and other light material can be accurately sawed (**22**; June 1948).

Small knots and other defects are drilled out of wood at the Victoria Lumber Co., Ltd., Chemainno, Vancouver Island, and a clear inlay of weatherboard plywood is driven into the holes by air hammer and fixed with a synthetic-resin glue. The product is called 'Inlay Clears' (**22**; May 1948).

The National Bureau of Standards has developed a synthetic melamine-formaldehyde resin which gives needed strength to paper made from the short-fibred wood of Poplar, Beech, Maple and Birch. In tests at the Bureau's semi-commercial paper mill, use of the resin produced strong paper from short-fibred trees, which compared favourably with that from standard pulp (**2**; June 1948).

China. A Metasequoia Conservation Committee has been formed for the preservation of the recently discovered Redwoods [see *For. Abstr.* 10 (No. 115).] The aim of the Committee is to lay out a large park round the trees so as to preserve the existing specimens and to find ways of propagating the species (**3**; 10.6.48).

Fiji. Experiments carried out in the cultivation of large-leaved Mahogany have given promising results and large-scale plantings will be proceeded with (**4**; July 1948).

Great Britain. The Forestry Commission have built 16 radio-controlled water carriers which can be sent quickly to the scene of a forest fire. These Windsor carriers are an improved version of the Bren-gun carrier. Armour plating has been removed to make way for two 180-gallon tanks, between which is mounted a pump which can deliver through the hoses a 60-ft. jet of water at a pressure of 80 lb./sq. in. for 25 minutes before the tanks need refilling. Each carrier is equipped with radio and can be directed from watch towers to the scene of any forest fire (**2**; June 1948).

The Post Office has developed a means of countering attacks on telephone poles by woodpeckers, which have long been a source of trouble [see *For. Abstr.* 9 (p. 393)]. It has been found that woodpeckers have ceased to attack wooden telephone poles as soon as the wires have been silenced, and it is therefore assumed that the humming of the wires encourages the birds to attack the poles. The wires are silenced by damping the vibration with a spiral lapping of lead strip bound round the line wires and insulator in 3 spiral turns and lapping along the wires for a distance of 10 in. It is the green and the greater spotted woodpeckers that are most likely to cause damage, which consists of holes 1–5 in. in diameter in apparently sound timber. When found, the holes are plugged with a special compound and the surface coated with tar (**23**; 19.6.48).

The first attempt to collect a comprehensive range of the new synthetic boards and plywoods under one roof is to be made by the Council of Industrial Design at an exhibition to be held at Murray House, Petty France, S.W.1, from 18th to 31st October. The idea is to demonstrate that such synthetic boards can be regarded not as makeshift substitutes for traditional materials but as interesting alternatives for the designers and manufacturers of kitchen equipment, furniture, and other consumer goods. Among the exhibits will be plywoods with metal veneers, boards coated with glass fibre, and plywoods with fillings of bonded waste products such as straw and linseed (**23**; 12.8.48).

Greece. Shortage of fuel in agricultural districts of Greece leads to illegal cutting of green trees and the burning of manure and straw. A study recently made in the village of Megali Vrisi, showed that about 90% of the farmers burn wood and spend much valuable time in gathering it. Wood or brush is essential for baking, owing to the design of the bread ovens. It is suggested that a stove should be designed, suitable for burning lignite coal, which is abundant in Greece (**7**; Mar. 1948).

Kenya. Jacaranda trees in East Africa have recently been attacked by a blight, *Orthezia insignis*, which causes a blackening disfigurement of the tree and all beneath it. The Forest Department has now imported a ladybird, *Hyperaspis jocosa*, from Hawaii in an attempt to control this pest (**5**; April 1948).

New Zealand. The New Zealand Forest and Rural Fires Act of 1947 provides for Fire Authorities covering all rural districts. State Forests will remain under the authority of the Commissioner of State Forests, Soil Conservation Districts under that of the Soil Conservation Central Council. Rural fire districts will be established in other areas, the authority being rural fire committees representative of owners of property protected and other affected persons. The Act will be administered by the Commissioner of State Forests, and over-riding powers for use in emergencies are vested in the State Forest Service (**17**; 1947).

Poisoning of dairy cows and calves through eating foliage (especially flowering heads) of felled *Cupressus macrocarpa* is reported from the Takaka district of New Zealand (**16**; Feb. 1948).

Philippines. Pre-war production of gum copal averaged 1,500 metric tons annually, all of which was exported. Elemi is another resinous product, obtained by tapping the Pili Nut tree [*Bursera* sp.]. European markets for this gum are closed by dollar shortages, and orders from the United States are infrequent, but stocks are being accumulated at Manila in anticipation of a revival of trade in this commodity (**8**; 26.6.48).

Siam. According to a recent official announcement, there is no likelihood of the Siamese Government's nationalizing the country's forest industries, because the return of Teak concessions to their pre-war British holders is bound by treaty. The total area of Teak forests being worked at present is 64,000 sq. km., of which about 37% is worked by the State-owned Forest Industry Organization. The area now being worked will be closed to cutting in 7 or 8 years, when the 15-year working period will have expired. Another area of 63,000 sq. km., at present closed, will then be opened. This closed area has been worked once before. The Siamese Government charges a royalty of $1·50/cu. ft. on Teak logs (**8**; 12.6.48).

Spain. An agreement has been signed between the Instituto Forestal and the Patronato Juan de la Cierva, by which an extensive, joint forest-products research programme will be undertaken. The subjects of research will include problems connected with cork, resin, cellulose, and indigenous and colonial timbers (**15**; March–April 1948).

Sweden. A mass outbreak of *Panolis flammea* has developed over a total of some 9,000 ha. An aerial dusting campaign is to be carried out with helicopters, and the Swedish Parliament has voted Kr.486,000 for the work, which will be done—under the scientific guidance of Prof. Butovitsch of the Forest Research Institute—by a company specializing in insect pest control. The campaign will also include the dusting of some smaller areas against *Cheimatobia brumata*. A helicopter will

deal with about 800 ha. per day. On each trip 150 kg. of insecticide can be carried and a total of about 1,000 trips will be made. Several insecticides will be tested, but DDT will be used for the most part. The cost of treatment is expected to be Kr.45 per ha. (**18**; 1.6.48).

An extraordinary situation has arisen in the Swedish pulp industry. Raw materials have become so short in Norrland that, to economize in timber, pulpwood supplies are being sought in Småland and Skåne. Sales have already been made and the wood will be towed in rafts to Norrland (**18**; 1.4.48).

Under a recent decree, children in the national schools will get up to 3 days' instruction per year in forestry, including both theory and practice, especially in sowing, planting and cone collection. Children in various types of school may also be given a fortnight's leave to take part in agricultural or forestry work, and if necessary, this period may be extended to three weeks (**18**; 15.4.48).

In 1946 the Swedish Parliament set aside 11 million Kr. of the funds accumulated from price-equalization dues [cf. *For. Abstr.* 8 (No. 620)] as a Forestry Research Fund, appointed a board to administer it, and laid down regulations for its use. Grants may be made in aid of either pure or applied research on forestry and forest products. The administering board itself is empowered to take measures to initiate research projects. The largest grants so far made have been to the Swedish Forest Tree Breeding Association (Kr.115,000) and to the newly established Swedish Wood Research Institute (Kr.132,000). Funds have also been granted for research in wood chemistry at the Universities of Uppsala and Lund, and for studies on friction in timber sledges (**21**; Dec. 1947).

U.S.A. An experimental planting of seed of Slash and Longleaf Pines treated by ultrasonic waves is being made at Texas Agricultural Experiment Station (**20**; 1.5.48).

Rats have killed about 20% of a 6-year-old Slash Pine plantation in Georgia. The rats girdled the trees by chewing off the bark and part of the wood, leaving the trees standing on a core of wood about 1 in. in diameter. The rats were killed by use of a mixture of DDT and Serasin with grain (**19**; 15.5.48).

Experimental work is being done on an experimental farm in Vermont to increase the flow of sap in the Maple tree. Although it is generally supposed that full growth takes 40–50 years, experiments have shown that trees transplanted on to lawns reach tapping size in about 20 years (**27**; June 1948).

The University of Washington has developed a process for treating White Fir [?*Abies lasiocarpa*] shingles with methylol-urea to make them weather-resistant. It is believed that by this means White Fir shingles can be produced with properties similar to those of Red Cedar and at a lower cost. A series of 5-year tests is being carried out (**14**; 7.4.48).

The St. Joe Paper Co., Port St. Joe, Florida, has been experimenting with the manufacture of kraft, book, bond, and mimeograph papers from wood of *Casuarina equisetifolia*, with encouraging results. When mixed with Slash-Pine pulp, it produces papers of unusually high tensile strength. It has already been established that *Casuarina* will grow well on sand hills or swamps in Florida (**20**; 15.4.48).

The Forest Products Laboratory at Madison, Wisconsin, has announced that a stabilized wood has been produced by the department's chemists. Wood is placed in a steam bath, the steam being a vapour of pyridine (a coal-tar derivative) and of acetic acid, which permeates and swells the cells of the wood. The swelling is permanent and the wood does not return to its original dimensions (**9**; Jan.–Feb. 1948).

The Central Point Fuel Co. has begun operations at an Oregon mill with a portable shavings baler. The machine, which weighs over a ton, presses bales varying from 75 to 100 lb., and up to 200 bales per day can be produced. The baled shavings are sold for chicken litter and bedding for dairy cattle and are said to have the advantages of being very absorbent and not packing down. (**9**; Jan.–Feb. 1948).

A swine-feeding experiment is in progress at Oregon State College, to compare the fodder value of wood-sugar molasses with cane and beet molasses and to test the value of brewer's yeast as a supplement to a wood-molasses ration. In another project, the comparative value of wood-sugar and beet molasses to improve the palatability of low quality hay is being tested (**25**; May 1948).

Redwood bark dust, a waste product from the manufacture of insulating material, has been found to make a valuable fungicide for use in wine factories. Another use for the dust has been discovered in the petroleum industry. In the past, oil drillers have relied upon tannin to lower the viscosity of

oil mud so that it can easily be brought to the surface. Tannin now being in short supply, a material named sodium palconate has been produced from Redwood bark dust, which appears to be superior to any other available oil thinner (**26**; April 1948).

U.S.S.R. According to an article in *Izvestiya*, aerial photography has been used for mapping the forests of Northern Europe and Siberia and for estimating war damage to forests in the western region. In 1946 aerial photography was used for surveying the woodlands of the Volga delta (50,000 ha. of wood and reed-bed mapped on a large scale in 3 days), and the forests of the Crimea (5 photographic flying-days). Interpretation of the photographs is carried out in the laboratory, using new methods of reading based on the spectral properties of the light reflected from different forest stands (**1**; Oct.–Dec. 1947).

The Turkmen Republic of the U.S.S.R. recently created a Ministry of Forestry to organize and supervise afforestation projects in its 16 forestry research centres and 46 forest reserves. Plans for 1948 include the planting of 300 ha. with drought-resistant trees and the establishment of tree belts along 3,000 km. of irrigation canals. Within the next few years, every collective farm in the Republic is expected to plant 1–2 ha. of trees, to set aside 3–5 ha. for orchards and 10–15 ha. for vineyards, and to plant trees along all the canals and waterways on the farm property. Although Turkmen is one of the least forested areas in the Soviet Union, because of its hot dry climate, the mountain regions do contain wooded areas of Acacia, Maple, Elm, Walnut, and other species (**8**; 24.4.48).

It has been decided to make an all-out effort for mechanization and workers' welfare in the forest industry. It is intended to replace manual by mechanical work wherever possible, and to this end it is proposed greatly to expand the production of tractors, lorries, winches, electric saw, etc. and to construct narrow-gauge railways at such a rate that in 1950 there will be almost 5 times the length of track that existed in 1940, to use bulldozers, etc. in roadbuilding, and to secure proper maintenance and repair services for mechanical equipment.

Logging and timber-floating concerns are to build forest villages, with schools, electric light, etc. The building programme will include large numbers (e.g. 2,000 in 1947 and 10,600 in 1948) of 2- or 3-roomed individual houses, costing 8,000–10,000 roubles, to be bought by the workers on loans repayable in 10 years. Provision has been made for certain woodworking plants to specialize in the production of these houses. The houses will have 0·5–0·75 ha. of land attached, and in some regions forest pasture also. From 1947, workers in these industries will be free from tax on income derived from their smallholdings, and their compulsory deliveries of milk and meat to the State will be half the normal figure for their respective regions. Workers taking permanent employment in forest industries in the Urals, Siberia, the Far East, North Russia and the Karelo-Finnish Republic will be granted 1,000 roubles for necessities plus 250 roubles for each member of their families accompanying them, repayable in 2 years. They can also claim a loan of 3,000 roubles, repayable in 3 years, for the purchase of domestic cattle (**12**; Sept. 1947).

Zanzibar. As from 1st March, 1948, only fibrous Mangrove bark (*Bruguiera gymnorrhiza*) will be permitted to be exported. This measure is designed to enable the *Rhizophora* forests to regenerate (**4**; April 1948).